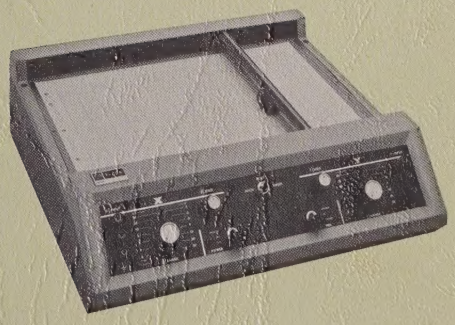
Please return to → Dr. W. Haydl

technical information

varian
recorder division

series
F-80A
x-y recorders



INSTRUCTION MANUAL

SERIES F-80A
X-Y RECORDER

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WARRANTY STATEMENT

Recorder products manufactured by the Recorder Division of Varian Associates are warranted to be free from defects in materials and workmanship. Liability under this warranty is limited to service or adjustment of equipment returned to the factory for that purpose and to replacement of defective parts. Expendable parts, e.g., mercury cells, vacuum tubes, and fuses are excluded from this warranty. The warranty is effective for one year from the date the equipment was shipped.

Terms of warranty are:

1. Notification of the malfunction or irregularity must be received by Varian Recorder Division Representative within the warranty period. Notification must include a full description of difficulties encountered, the model and serial number of the equipment, name of representative from whom the equipment was purchased, and the original shipping date.

2. The equipment must be determined by Varian or its representative to have become defective through no fault of the owner (user).

Should it become necessary to return an instrument for warranty repair, please follow the instructions in paragraph 4.2 - FIELD AND FACTORY SERVICE.

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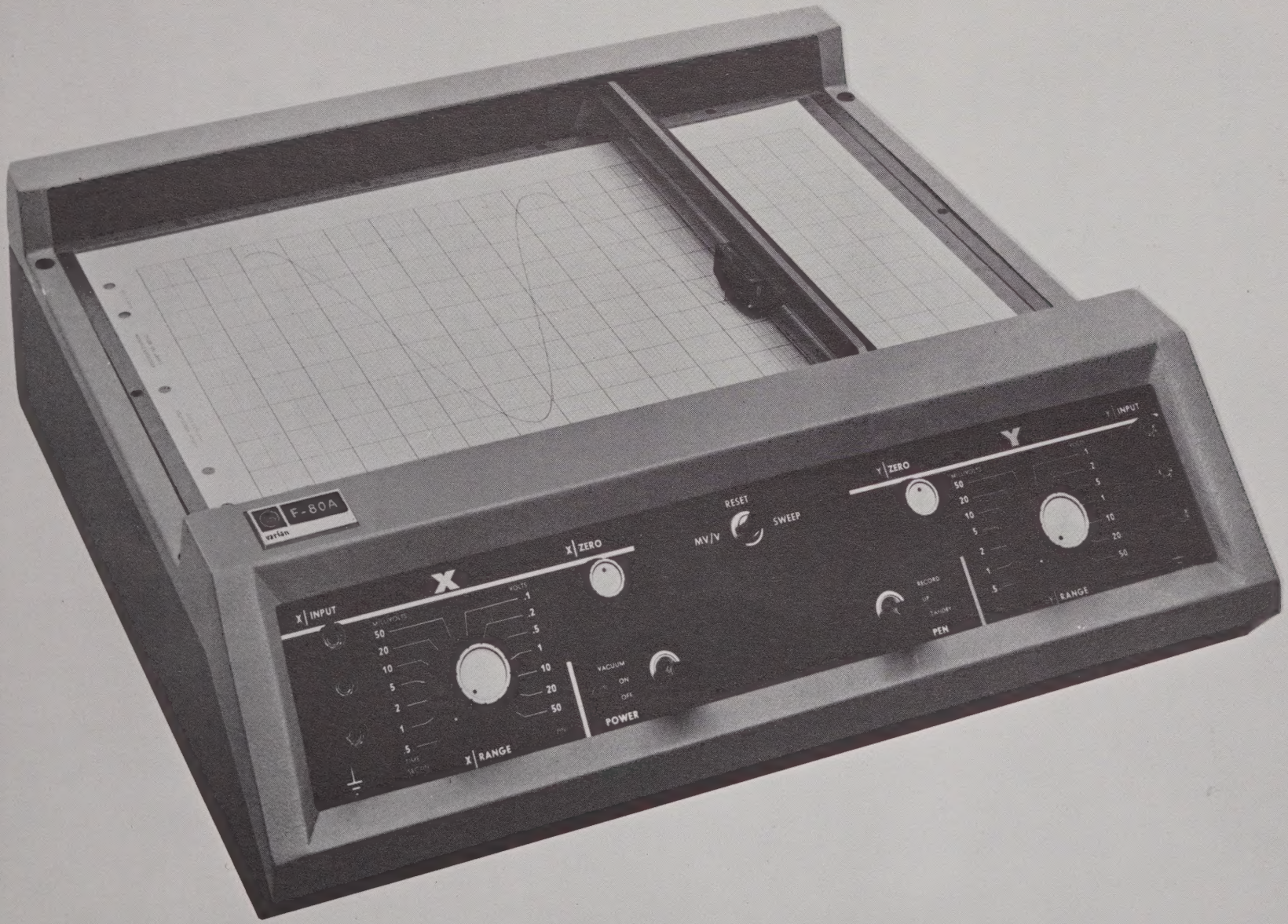

F-80A
varian
X
X INPUT
X ZERO
X RANGE
RESET
MV/V
SWEEP
POWER
VACUUM
ON
OFF
PEN
RECORD
UP
Y
Y ZERO
Y INPUT
Y RANGE

SECTION 1
INTRODUCTION

1.1 GENERAL

The Varian F-80A series of recorders consists of two basic units, each of which is available with either inch or metric calibration and 115V or 230V, 50 Hz or 60 Hz input power. These recorders feature a design approach which provides the user with paper loading ease, simplified pen servicing, functional controls and styling. The novel vacuum hold-down system permits secure paper placement with precise alignment. These recorders use the null-balance, potentiometric principle to provide precise pen movement in response to variations in dc input signals or time base sweeps.

The two basic recorders are described as follows:

F-80A

Standard X-Y recorder including a built-in time sweep controlled by a switch on the control panel. The pen lifts automatically at the end of its travel. The operator may then reset the carriage by using the mode switch.

F-81A

The F-81A features all the performance and design advantages of the F-80A except the time base is not included. For those not requiring a built-in time base, it offers a substantial reduction in investment while maintaining all the valuable features usually found only in high cost units. The simplified control panel makes the F-81A even easier to operate, ideal for production line testing applications.

The following schematic diagrams are shown in Section 6:

Drawing No.	Title
971-698	Power Supply/Power Amplifier Schematic
972-036	Schematic - Pre-Amplifier
971-823	Translation Wiring Diagram

1.1 Continued

Section 6 of this manual also contains the following diagrams for each model:

Model	Drawing No.	Title
F-80A & AM	971-765	Wiring Diagram
F-80A	971-777	Schematic (Inch)
F-80AM	971-778	Schematic (Metric)
F-80A	972-035	Schematic - Time Base
F-81A & AM	972-011	Wiring Diagram
F-81A	972-038	Schematic (Inch)
F-81AM	972-041	Schematic (Metric)

1.2 CONSTRUCTION

A sturdy precision casting maintains alignment of all moving components. The electronic subassemblies are easily removable for servicing. Enclosed position feedback potentiometers and self-aligning bearings requiring no lubrication are featured. The major assemblies are:

Bottom Plate Assembly

- Two pre-amplifier assemblies
- Two Power Supply/Power Amplifier Modules
- Time Sweep Assembly (F-80A only)
- Control Panel Assembly

Translation Assembly

Case Assembly

1.2.1 Bottom Plate Assembly

The bottom plate assembly consists of a sturdy 1/8-inch thick plate upon which are mounted the electronic subassemblies and the control panel.

1.2.1.1 Pre-Amplifier Assembly

The servo system pre-amplifier is a transformer-coupled, high input resistance, high gain, solid state amplifier mounted on a printed circuit board. The board may be easily removed by disconnecting two multipin connectors and removing four holding screws.

1.2.1.2 Power Supply/Power Amplifier Module

The power supply/power amplifier module contains dc power supplies for the pre-amplifier and reference bridge, and a power amplifier to drive the servo motor. The module may be easily removed by disconnecting a single 22-pin connector and removing the holding screws.

1.2.1.3 Time Sweep Assembly

The time sweep assembly consists of the sweep generator components mounted on a printed circuit board. The sweep calibration and linearity adjustments are located on the printed circuit board. The board may be removed by disconnecting a single multipin connector and removing the holding screws.

1.2.1.4 Control Panel Assembly

The operating controls and signal input terminals are located on the control panel assembly. Fourteen calibrated ranges from 0.5 mv/inch to 50 v/inch are provided by the attenuator switch. A vernier adjustment is provided for uncalibrated ranges. The amplifier gain, damping, and calibrate adjustments are located at the top rear of the panel. The control panel may be mounted in either of two positions. In the bench-top cabinet, it is at a functional angle for convenience of operation. For rack mounting, the panel is rotated to be in the same plane as the platen.

1.2.2 Translation Assembly

The translation assembly consists of a sturdy casting upon which are mounted all the moving components of the X and Y axes servo systems. The feedback potentiometers are driven through a Mylar belt slip clutch which prevents the motor from stalling when the pen is driven off scale. The pen carriage is driven with plastic-covered steel cable.

The pen is attached to the carriage with a self-aligning permanent magnet. Simply touch the pen in place, it is in perfect alignment. To remove, simply lift it away. The pen operates equally well for vertical or horizontal mounting. The pen is raised or lowered by a solenoid-driven mechanism.

1.2.3 Case Assembly

The F-80A series recorders are available in either a bench-top or rack-mount case, as specified by the customer. The rack-mount case fits into a standard 19" equipment rack. Kits are available from Varian for field conversion of either type of mounting to the other.

1.3 DETAILED SPECIFICATIONS

Ranges, dc, calibrated	Standard Models: 0.5, 1, 2, 5, 10, 20, 50, 100, 200, 500 mv/inch; 1, 10, 20, 50 v/inch. Metric Models: 0.2, 0.5, 1, 2, 5, 10, 20, 50, 100, 200, 500 mv/cm; 1, 10, 20 v/cm. Continuously adjustable vernier between calibrated ranges.

1.3 Continued

Input Resistance

STANDARD MODELS

Range	Resistance
0.5 mv/in	Potentiometric, virtually infinite
1 mv/in	20K ohms
2 mv/in	40K ohms
5 mv/in	100K ohms
10 mv/in	200K ohms
20 mv/in	400K ohms
50 mv/in	1 megohm
100 mv/in to 50 v/in	2 megohms, Constant

METRIC MODELS

0.2 mv/cm	Potentiometric, virtually infinite
0.5 mv/cm	25K ohms
1 mv/cm	50K ohms
2 mv/cm	100K ohms
5 mv/cm	250K ohms
10 mv/cm	500K ohms
20 mv/cm	1 megohm
50 mv/cm to 20 v/cm	2.5 megohms, Constant

Input Type

Two independent, differential inputs. May be operated up to ±200 vdc from chassis ground.

Accuracy

Static: 0.2% of full scale; 0.3% range-to-range.
Dynamic: 0.25% of full scale; 0.35% range-to-range (10 in/sec).

Resetability

0.1%

Slew Velocity

60 Hz

Standard Models: 17 in/sec, each axis
Metric Models: 43 cm/sec, each axis

50 Hz

Standard Models: 14 in/sec, each axis
Metric Models: 35 cm/sec, each axis

Damping

Adjustable electrical; set for negligible overshoot for full scale step function inputs.

1.3 Continued

Zero Adjustment	Full scale plus 100% suppression, each axis. Adjustable Y axis stop provided.
Reference	Internal, two independent double Zener regulated supplies.
Permissible Source Resistance	100K on 0.5 mv/in range (or 0.2 mv/cm)
60 Hz Rejection Ratios, Minimum	Transverse - 40 db Longitudinal - 120 db
DC Longitudinal Rejection Ratio, Minimum	150 db
Time Base Ranges (F-80A) only	Standard Model: 50, 20, 10, 5, 2, 1, 0.5 sec/inch, fixed. Metric Model: 20, 10, 5, 2, 1, 0.5, 0.2 sec/cm, fixed.
Time Base Accuracy	3% all ranges; adjustable to 1% on any range.
Paper Hold-Down	Vacuum; supplied by quiet, maintenance-free fan.
Platen Size	11-3/4" x 16-7/8" (30 x 43 cm); precision aligned paper guides.
Recorder Size	Bench top: 19" W x 19" D x 5-3/4" H (48 x 48 x 15 cm) Rack mount: 19" W x 21" H x 3-1/2" D (48 x 54 x 9 cm) Mounts in standard 19" rack.
Weight	Net: 35 lbs (16 kg) Shipping: 50 lbs (23 kg)
Power Requirements	105-125 or 210-240 vac, 60 or 50 Hz, 100 watts.

1.4 EQUIPMENT SUPPLIED

The recorder is shipped with all of the necessary components required for immediate operation. Standard accessory items and supplies include:

Varian Part Number	Description	Quantity
87-300-802	Instruction manual	1
(Per S/O)	Chart paper	100 sheets
907-360	Pen kit, containing	1
971-737-01	Red ink	1 oz.
971-737-06	Blue ink	1 oz.
907-858	Pen assembly	2
907-359	Y-axis stop	1
972-499	Pen cleaning wire	1 ft.
907-674	Pen filler	1
29-899-859	Allen wrench	1
29-899-863	Allen wrench	1
972-087-03	Plastic dust cover (bench models only)	1
907-214	Power cord	1
88-299-450	Motor oil	2 oz.
67-135-410 or 67-135-350	Fuse, 1 amp (115V only) or Fuse, 0.5 amp (230V only)	2
	Warranty registration card	1

1.5 OPTIONAL EQUIPMENT

The following optional equipment is available with the Series F-80A recorders:

Retransmitting Potentiometer

May be installed on one or both axes. The retransmitter is supplied with a standard feedback potentiometer as an integral unit. Available with resistance values between 100 and 100K ohms, ±5%. Standard linearity is 0.1% (0.2% on 100 ohms). It is recommended that this unit be factory installed.

Rear-Access Input Terminals

In addition to the standard input terminals on the control panel, rack-mounted recorders can be provided with two extra sets of three signal input terminals. These are mounted on the bottom plate (rear of recorder when mounted in rack) and wired in parallel with the control panel terminals.

1.5 Continued

Rack-Mounting Conversition Kit

For field conversion of bench-top configuration to rack configuration. Includes panels, case top, shields, and hardware. Vertical rack space of 21" is required.

Bench-Mounting Conversion Kit

For field conversion of rack configuration to bench-top configuration. Includes upper and lower halves of case and necessary hardware.

Remote Pen Lift Connection

Circuitry to permit a remote switch or relay to control pen lowering and lifting.

Roll Chart Adapter

This manually-operated easy-to-install unit allows the use of X-Y charts in roll form on bench-top models.

Service Cable Kit

Includes extension cables required to permit full operation of the recorder when the basic mechanical and electrical systems are separated for servicing.

Dust Cover

Replacement or additional plastic dust covers are available for bench-top models.

SECTION 2
INSTALLATION

2.1 GENERAL

Each Series F-80A recorder is shipped complete in one commercial-grade shipping container. If the container has been damaged in transit, notation of the damage should be made on the shipping receipt. If the recorder and/or accessory items have been damaged, notify the carrier claim agent. He will provide instructions and forms for reporting and describing the damage.

C A U T I O N

DO NOT ATTEMPT TO OPERATE
DAMAGED EQUIPMENT.

Send one copy of the carrier claim form to the attention of Marketing Manager, Recorder Division, Varian Associates, 611 Hansen Way, Palo Alto, California, 94303.

When unpacking the recorder, check carefully to insure that all components ordered have been supplied. If there are any discrepancies, notify Varian Recorder Division immediately. The packing box should be retained for use should the instrument need to be returned for repair or accessory installation. Fill out and mail the registration card which insures that the warranty will be validated.

After unpacking the recorder, it should be given a visual inspection as outlined below.

2.2 VISUAL INSPECTION

The recorder and accessory items should be visually inspected to assure that no damage to the equipment has occurred in transit. Among the points to be covered are the following:

1. Both the X carriage and the Y carriage should move smoothly over their full excursions.

2. All screws should be tightly secured.

3. Check that all switches operate properly.

2.2 Continued

4. Check that the correct fuse is properly inserted in its holder.

Correct fuse values are as follows:

Power Requirement	Slo-blo Fuse	Varian Part Number
115V, 60 Hz	1.0 amp	67-135-410
230V, 50 Hz	0.5 amp	67-135-350

When the recorder is ready for operation proceed to Section 3 - OPERATION. Read all applicable paragraphs of Section 3, install chart paper, fill the reservoir and pen with ink, and give the recorder an electrical inspection before operating the instrument for the first time.

After it has been determined that the recorder is operating properly, proceed to either paragraph 3.7.2 or 3.7.3 for detailed operating instructions.

2.3 RACK-MOUNTING PROCEDURE

2.3.1 Parts Included in Rack-Mounting Conversion Kit, Varian Part No. 907-464-01

Varian Part Number	Description	Quantity
906-705-02	Case top	1
907-450	Front shield	1
907-451	Rear shield	1
907-827-01	Panel, top	1
907-827-02	Panel, bottom	1
907-826	Shield, input	1
971-940	Nameplate	1
12-222-006-08	Screw, Phillips pan head, 6-32 x 1/2"	2
12-222-008-08	Screw, Phillips pan head, 8-32 x 1/2"	2
12-222-004-08	Screw, Phillips pan head, 4-40 x 1/2"	2
12-222-060-10	Screw, Phillips pan head, 10-32 x 5/8"	8
14-202-006	Washer, lock #6	2
14-122-004	Washer, flat #4	2
14-122-006	Washer, flat #6	2
13-311-104	Nut, Keps 4-40	2
13-311-108	Nut, Keps 8-32	2

2.3.2 Installation

The Varian Series F-80A Rack-Mounting Conversion Kit contains all the necessary parts and hardware for the conversion of a bench-top type of any recorder in the F-80A Series to a rack-mount type of unit. The following procedure should be followed to accomplish this conversion. A standard 19-inch rack having a 17-3/4" horizontal inside clearance will accommodate the recorder. Vertical rack space of 21" is required.

It will be necessary, with F-80A Series recorders having serial numbers below number 1026, to drill four holes in the base plate in accordance with Figure 2-1.

STEP 1. Disconnect the power cord from the recorder.

STEP 2. Remove the four 10-32 x 3/8 Allen drive screws that secure the top cover to the recorder. The Allen wrench furnished with the recorder can be used to remove these four screws, which should be saved for use later in this procedure.

STEP 3. Turn the POWER switch to VACUUM, and the PEN switch to RECORD. Lift the top cover at the rear of the recorder until it breaks free of the bottom cover. Then, lift the cover up and toward the front of the recorder.

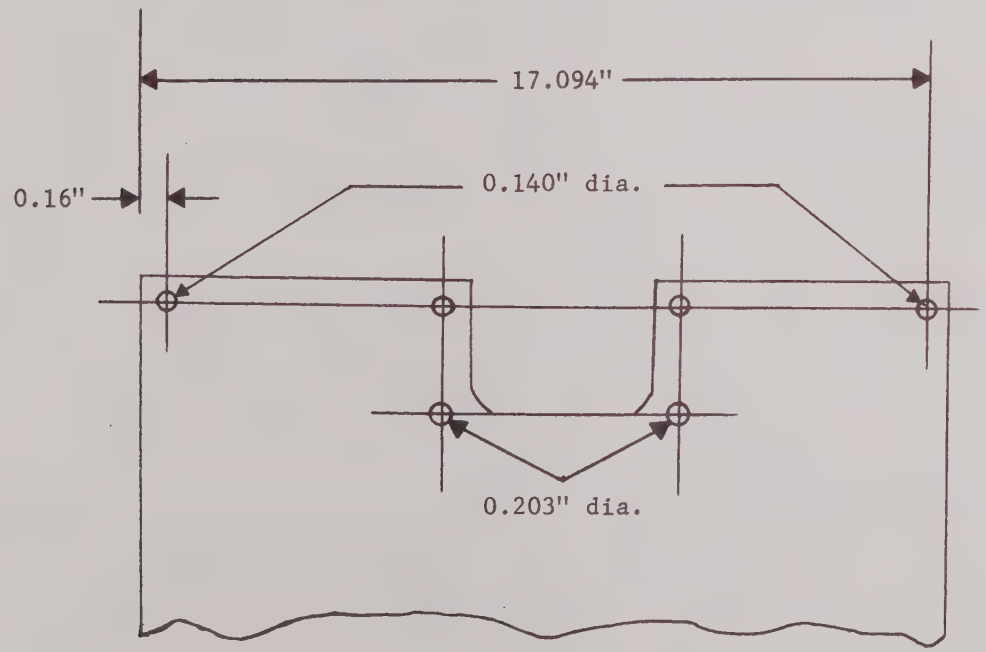


FIGURE 2-1

2.3.2 Continued

C A U T I O N

DO NOT LIFT THE RECORDER
BY MEANS OF THE CARRIAGE
OR THE RODS ON WHICH THE
CARRIAGE SLIDES.

STEP 4. Remove the four 10-32 x 3/8" Phillips screws that secure the bottom cover to the translation casting. Grasping the casting, lift the recorder upward and forward away from the bottom cover. Set the recorder back on the work bench with the front edge of the recorder protruding slightly over the edge of the bench.

STEP 5. Disconnect the two Amphenol connectors located on the base plate just behind the front control panel.

STEP 6. Slide the recorder forward to expose two 8-32 Phillips screws that secure the casting to the base plate. Remove these screws from the underside of the base plate; then turn the recorder around and remove the other two 8-32 screws, using the same procedure.

STEP 7. Carefully lift the casting approximately three inches above the base plate; then, holding the casting with the fan assembly in one hand, disconnect the multipin Amphenol plug from its mating jack which is located on the center, rear of the base plate.

STEP 8. Lift the casting free and set it aside. Turn the base plate around so the control panel is facing the technician.

STEP 9. Remove the two 6-32 x 1/2" Phillips screws, flat washers, and lock washers that secure the front control panel mounting brackets to the base plate of the recorder. Rotate the control panel until it lies in the horizontal plane. Secure the brackets to the plate with the same two screws and washers.

STEP 10. Secure the front shield (perforated) provided in the conversion kit to the control panel mounting brackets. Use the two 6-32 x 1/2" Phillips pan head screws, two #6 lock washers, and two #6 flat washers.

2.3.2 Continued

STEP 11. Turn the recorder around and allow about 3 inches to overhang the edge of the work bench. Remove the two 8-32 x 3/8" Phillips screws that secure the rear connector panel to the base plate. Remove the two 6-32 x 5/16" Phillips screws from the power supply mounting brackets which hold the power supplies to the base plate. Remove the cover (insulation) that covers an opening in the base plate. Swing the connector panel under the base plate and allow to hang free. Replace the 6-32 screws.

STEP 12. Place the rear shield, furnished in the conversion kit, at right angles along the rear edge of the base plate. The mounting edges of the rear shield should be on top of the base plate. Secure the rear shield at each of the back corners with a 4-40 x 1/2" Phillips screw, #4 flat washer, and 4-40 Keps nut.

STEP 13. Position the input shield (box) on the underside of the base plate so that the four holes in the box are in alignment with the four holes surrounding the opening in the plate. Pass an 8-32 x 1/2" Phillips screw through each of the two holes closest to the rear edge of the plate, through the box, base plate, and rear shield. Secure the screws with the 8-32 Keps nuts.

STEP 14. Position the rear connector panel so that the opening in the input shield is covered and the holes in the panel are aligned with the other two holes in the base plate. Secure the connector panel using the two 8-32 x 3/8" Phillips screws removed in Step 11.

STEP 15. Replace the translation casting on the base plate using the reverse of Steps 5 through 8. Be careful that drive cord stringing avoids contact with potentiometer shafts at the rear of the control panel.

STEP 16. Refer to Figure 2-2 and determine the location of tapped holes in the rack that are to be used for mounting (1) the top panel (wide trim strip), (2) the recorder, and (3) the bottom panel (narrow trim strip).

STEP 17. Mount the top panel as shown in Figure 2-2. Use 10-32 x 5/8" Phillips screws, or other appropriate screws, to secure the panel to the rack.

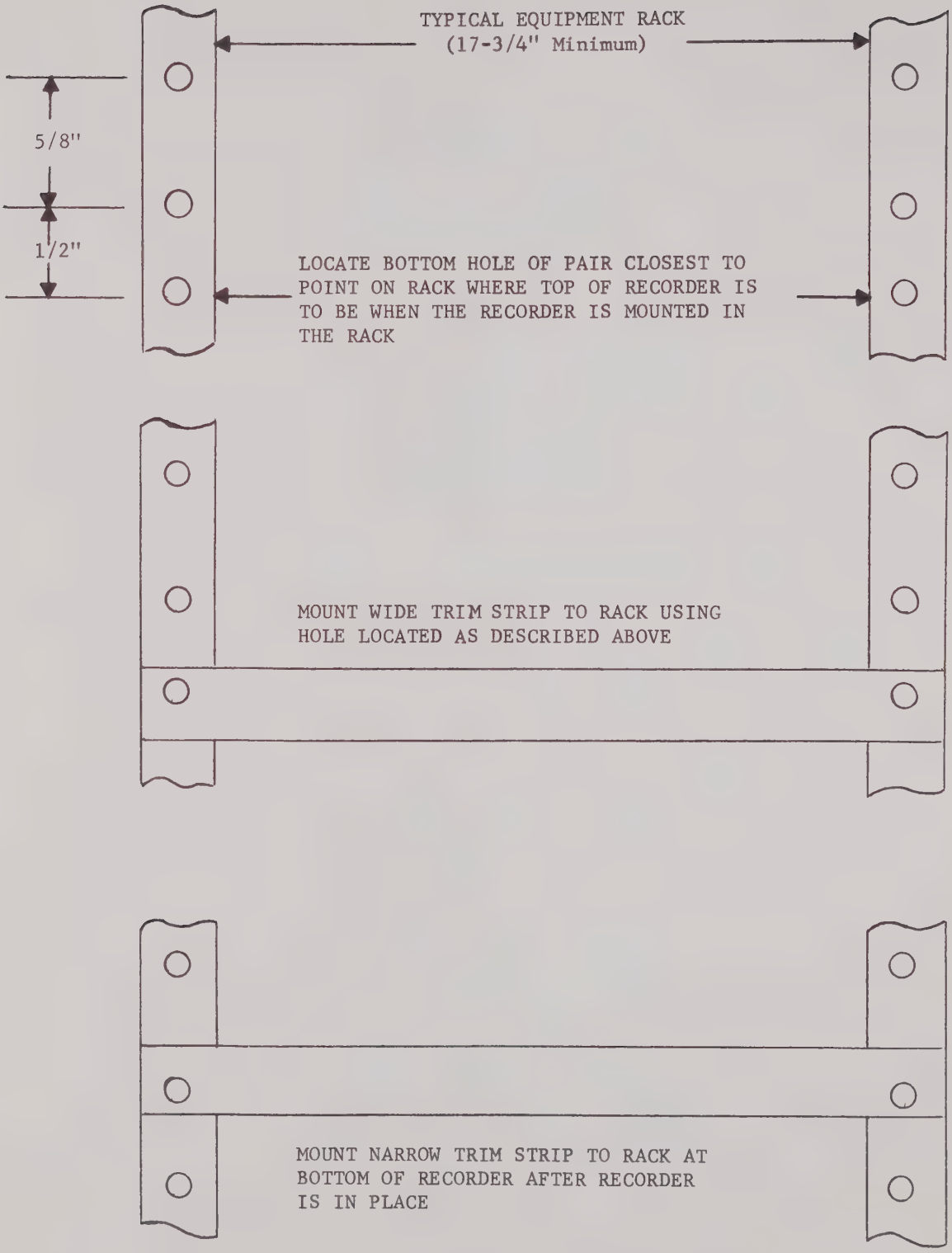

TYPICAL EQUIPMENT RACK
(17-3/4" Minimum)
5/8"
1/2"
LOCATE BOTTOM HOLE OF PAIR CLOSEST TO POINT ON RACK WHERE TOP OF RECORDER IS TO BE WHEN THE RECORDER IS MOUNTED IN THE RACK
MOUNT WIDE TRIM STRIP TO RACK USING HOLE LOCATED AS DESCRIBED ABOVE
MOUNT NARROW TRIM STRIP TO RACK AT BOTTOM OF RECORDER AFTER RECORDER IS IN PLACE

FIGURE 2-2. TYPICAL EQUIPMENT RACK MOUNTING DESIGNS

2.3.2 Continued

STEP 18. Lift the recorder by the translation casting into position on the rack. Secure in place using the four 10-32 x 5/8" Phillips screws, or the four 10-32 x 3/8" Phillips screws removed in Step 4, or other appropriate screws.

STEP 19. Mount the bottom panel as shown in Figure 2-2 to the rack with 10-32 x 5/8" Phillips screws, or other appropriate screws.

STEP 20. Place the case top furnished in the kit over the front control panel and onto the translation casting. Secure the case top with the four 10-32 x 3/8" Allen screws removed in Step 2.

NOTE

Alignment of the front control panel with respect to the opening in the case top is controlled by four 8-32 x 3/16" Allen-socket-head set screws protruding from the under surface of the base plate under the control panel mounting brackets.

STEP 21. Turn the POWER switch to OFF and the PEN switch to STANDBY. Reconnect the power cord to the rear connector panel.

2.4 BENCH-MOUNTING PROCEDURE

2.4.1 Parts Included in Bench-Mounting Conversion Kit, Varian Part No. 907-464-02

Varian Part Number	Description	Quantity
906-698	Case, top	1
906-700	Case, bottom	1
907-230	Grommet, input	1
971-940	Nameplate	1
12-331-060-06	Screw, 10-32 x 3/8" flat cap	4
12-222-060-10	Screw, 10-32 x 5/8"	4
907-398	Cover	1

2.4.2 Installation

The Varian Series F-80A Bench-Mounting Conversion Kit contains all the necessary parts and hardware for the conversion of a rack-mount type of any recorder in the F-80A Series to a bench-top type of unit. The following procedure should be followed to accomplish this conversion.

STEP 1. Disconnect the power cord from the recorder.

STEP 2. Turn the POWER switch to VACUUM and the PEN switch to RECORD.

STEP 3. Remove the four 10-32 x 3/8" Allen drive screws that secure the top cover to the recorder. The Allen wrench furnished with the recorder can be used to remove these four screws, which should be saved for use later in this procedure.

STEP 4. Support the recorder by means of the translation casting, NOT BY MEANS OF THE CARRIAGE OR RODS ON WHICH THE CARRIAGE SLIDES, and remove the four screws that secure the recorder to the equipment rack.

STEP 5. Set the recorder on a work bench with the front edge of the recorder protruding slightly over the edge of the bench.

STEP 6. Remove the two 6-32 x 1/2" Phillips pan head screws, two #6 lock washers, and two #6 flat wahers which secure the front shield (perforated) to the control panel mounting brackets. The shield and hardware may be saved for possible future reconversion of the recorder to rack-mounting.

STEP 7. Remove the two 6-32 x 1/2" Phillips screws, flat washers, and lock washers that secure the control panel mounting brackets to the base plate of the recorder. Rotate the control panel until it lies in a plane approximately 30° from the horizontal. Secure the brackets to the plate with the same two screws and washers.

STEP 8. Disconnect the two Amphenol connectors located on the base plate just behind the front control panel.

STEP 9. Slide the recorder forward to expose two 8-32 Phillips screws that secure the casting to the base plate. Remove these screws from the underside of the base plate; then turn the recorder around and remove the other two 8-32 screws, using the same procedure.

2.4.2 Continued

STEP 10. Carefully lift the casting approximately three inches above the base plate; then, holding the casting with the fan assembly in one hand, disconnect the multipin Amphenol plug from its mating jack which is located on the center, rear of the base plate. Lift the casting free and set it aside.

STEP 11. Remove the two 8-32 x 3/8" Phillips screws that secure the rear connector panel to the base plate.

STEP 12. Remove the two 8-32 x 1/2" Phillips screws which secure the input shield (box) to the base plate and rear shield. Remove the input shield.

STEP 13. Remove the 4-40 x 1/2" Phillips screw, #4 flat washer, and 4-40 Keps nut from each back corner of the base plate and remove the rear shield. These items may be retained for possible reconversion of the recorder to rack-mounting.

STEP 14. Swing the connector panel up onto the top of the base plate.

STEP 15. Remove the screws which secure the power supply mounting brackets to the base plate.

STEP 16. Place the cover (insulation) found in the conversion kit over the opening in the base plate; then, inserting the 8-32 x 3/8" Phillips screws (removed in Step 11) through the base plate from the underside, secure the connector panel (and cover) perpendicular to the base plate.

STEP 17. Replace the screws in the power supply mounting brackets (reverse Step 15), through the cover and into the base plate.

STEP 18. Replace the translation casting on the base plate using the reverse of Steps 8 through 10. Be careful that drive cord stringing avoids contact with potentiometer shafts at the rear of the control panel.

STEP 19. Place the bottom case on the work bench adjacent to the recorder with the surface having the rectangular opening at the rear of the work bench.

2.4.2 Continued

STEP 20. Lift the recorder by means of the casting and place it on top of the bottom case. Secure the recorder to the bottom case with four 10-32 x 5/8" Phillips screws supplied in the conversion kit.

STEP 21. Place the top case, found in the conversion kit, on top of the recorder. Mate the top and bottom cases at the front edge; then, down on the sides and rear of the top case until it snaps into place. Secure the top case with four 10-32 x 3/8" flat cap screws provided in the kit (the screws removed in Step 3 may be used).

STEP 22. Turn the POWER switch to OFF and the PEN switch to STANDBY. Reconnect the power cord to the connector panel.

2.5 INSTALLATION OF Y-AXIS STOP

To stop the travel of the pen at any desired point on the Y axis, a "Y" stop is provided. To install, simply engage the Y stop with the Y rod and tighten in place using an Allen wrench.

SECTION 3
OPERATION

3.1 GENERAL

The F-80A series of recorders can be used to record varying dc voltages that represent a wide variety of electrical or physical phenomena. Only the following steps need to be performed when using the recorder:

(1) Connect recorder to primary power

(2) Install chart paper

(3) Fill pen and reservoir with ink

(4) Place operating controls in correct positions

(5) Connect recorder to signal source

(6) Monitor recorded trace

3.2 PRIMARY POWER REQUIREMENTS

Recorders are shipped ready for operation from a primary power source of 115 or 230 vac, 60 or 50 Hz. Each recorder comes equipped with a 3-conductor power cable terminated with a standard power plug. A decal mounted on the bottom of the recorder indicates power specifications for the recorder.

3.3 INSTALLATION OF CHART PAPER

STEP 1. Place the power switch at VACUUM. The fan will start, furnishing vacuum to the writing platen.

STEP 2. Place a sheet of chart paper on the platen, aligning left-hand and bottom edges with guide strips on the platen.

3.4 PEN FILLING PROCEDURE

The pen assembly reservoir can be filled initially or refilled as follows:

STEP 1. Place the pen switch at STANDBY.

STEP 2. Remove the pen assembly by simply pulling it directly away from the pen carriage.

STEP 3. Fill the pen filler, furnished with the recorder as an accessory, with ink. Insert the tip of the pen filler into the hole in the top of the pen assembly and transfer the ink to the reservoir.

STEP 4. Place the small piece of plastic tubing, furnished with the pen filler, over the pen filler needle and over the tip of the pen. Use the pen filler to draw ink from the reservoir into the pen tip.

STEP 5. Replace the pen assembly on the pen carriage so that it is in proper alignment with the magnet mounted on the carriage.

3.5 SIGNAL SOURCE CONNECTION

The control panel of the recorder contains two sets of three binding post terminals. Those on the left connect to the X-axis circuits; those on the right connect to the Y-axis circuits. In each set, the red post is the positive terminal, one black post is the negative or signal ground terminal, and the other black binding post is the chassis ground terminal. The signal input terminals of both X and Y axes may each be floated independently up to $\pm$200 vdc from chassis ground.

3.6 REMOTE PEN LIFT OPERATION (OPTIONAL)

Short pins A and B on the 9-pin miniature hex connector at the rear of the recorder. This connection automatically drops the pen to the paper. Thus, a remote switch or relay can be used to control pen lowering and lifting.

3.7 OPERATION OF CONTROLS

The F-80A recorder can be operated as either an X-Y or Time-Y graphic recorder. The mode switch (MV/V, RESET, SWEEP), located in the center of the control panel, selects the desired mode of operation. When the X-Y mode is desired, turn the mode switch to MV/V. When the Time-Y mode is desired, turn the mode switch to either RESET or SWEEP. Use of the remaining controls in both modes is described in the following paragraphs. With appropriate,

3.7 Continued

readily-apparent deletions, these instructions can be followed for F-81A recorders as well.

3.7.1 Electrical Inspection

If an electrical or mechanical failure occurs during this inspection, refer to paragraph 4.6.2 and perform a detailed physical inspection of the recorder.

STEP 1. Turn the POWER switch to OFF and the PEN switch to STANDBY.

STEP 2. Make sure the pen is filled with ink and is properly seated. See paragraph 3.4.

STEP 3. Connect the recorder to a proper source of power. See paragraph 3.2.

STEP 4. Turn the POWER switch to VACUUM and observe that the fan and power indicator light come on.

NOTE

If the indicator lamp does not light, turn the POWER switch to OFF and check the fuse at the rear of the recorder.

STEP 5. Place the mode switch in the MV/V position, and the PEN switch in the UP position.

STEP 6. Place a sheet of chart paper on the platen. Note that the vacuum holds the chart in place, but that the paper can be repositioned with the vacuum on. Align the left-hand and bottom edges of the chart paper with guide strips on the platen.

STEP 7. Short the X-axis and Y-axis input terminals together (red to black).

STEP 8. Turn the X-axis ZERO control until the tip of the pen is aligned with the left margin of the chart paper.

NOTE

Turn the PEN switch to RECORD to lower the pen tip to the paper for more accurate alignment. Return the switch to UP after the ZERO control has been adjusted.

STEP 9. Turn the Y-axis ZERO control until the tip of the pen is aligned with the bottom margin of the chart paper.

STEP 10. Rotate the X-axis variable attenuator control (inner knob of range switch) fully CCW and the X-axis range switch (outer knob) to the 5 position.

STEP 11. Rotate the Y-axis variable attenuator control fully CCW and the Y-axis range switch to the 5 position.

STEP 12. Connect a dc test voltage of 75 millivolts (195 millivolts for metric units) between the red (+) and black (-) X-axis signal input terminals.

STEP 13. Connect a dc test voltage of 50 millivolts (140 millivolts for metric units) between the red (+) and black (-) Y-axis signal input terminals.

STEP 14. Remove the shorts from the X-axis and Y-axis signal input terminals and observe that the pen assembly moves to the upper right-hand corner of the chart paper.

STEP 15. Lower the pen tip to the chart paper and observe that the pen tip is in exact alignment with the upper and right-hand margins of the chart paper.

NOTE

If the pen tip is not properly aligned, perform the calibration procedure given in paragraph 4.8.

3.7.2 X-Y Mode of Operation

For X-Y operation, proceed as follows:

STEP 1. Turn the POWER switch to OFF and the PEN switch to STANDBY.

STEP 2. Make sure the pen is filled with ink and is properly seated. See paragraph 3.4.

STEP 3. Determine that the recorder is connected to a proper power source. See paragraph 3.2.

STEP 4. Turn the mode switch to MV/V.

STEP 5. Turn the POWER switch to ON and observe that the power indicator light comes on.

NOTE

If the indicator lamp does not light, turn the POWER switch to OFF, and check the fuse at the rear of the recorder.

STEP 6. Turn the POWER switch to VACUUM. Place a sheet of chart paper on the platen. Note that the vacuum holds the chart in place, but that the paper can be re-positioned with the vacuum on. Align the left-hand and bottom edges of the chart paper with guide strips on the platen.

STEP 7. Determine that the input signals to be monitored are properly connected to the signal input terminals of the recorder. See paragraph 3.5.

STEP 8. Rotate the X-axis variable attenuator control (inner knob of range switch) fully CCW and the X-axis range switch (outer knob) to a position corresponding to the maximum amplitude of the signal voltage connected to the X-axis input terminals. Table 3-1 or 3-2 can be used as a guide.

STEP 9. Rotate the Y-axis variable attenuator control fully CCW and the Y-axis range switch to a position corresponding to the maximum amplitude of the signal voltage connected to the Y-axis input terminals. Table 3-3 or 3-4 can be used as a guide.

TABLE 3-1. X-RANGE SWITCH SIGNAL INPUT SETTINGS FOR STANDARD MODELS

WIDTH OF CHART PAPER	MAXIMUM AMPLITUDE OF INPUT SIGNAL	RANGE SWITCH SETTING
15 inches	0 to 7.5 millivolts	0.5 mv/in
15 inches	7.6 to 15 millivolts	1 mv/in
15 inches	16 to 30 millivolts	2 mv/in
15 inches	31 to 75 millivolts	5 mv/in
15 inches	76 to 150 millivolts	10 mv/in
15 inches	151 to 300 millivolts	20 mv/in
15 inches	301 to 750 millivolts	50 mv/in
15 inches	0.76 to 1.5 volts	0.1 v/in
15 inches	1.6 to 3 volts	0.2 v/in
15 inches	4 to 7.5 volts	0.5 v/in
15 inches	7.6 to 15 volts	1 v/in
15 inches	16 to 150 volts	10 v/in
15 inches	151 to 300 volts	20 v/in
15 inches	301 to 750 volts	50 v/in

TABLE 3-2. X-RANGE SWITCH SIGNAL INPUT SETTINGS FOR METRIC MODELS

WIDTH OF CHART PAPER	MAXIMUM AMPLITUDE OF INPUT SIGNAL	RANGE SWITCH SETTING
39 centimeters	0 to 7.8 millivolts	0.2 mv/cm
39 centimeters	7.9 to 19.5 millivolts	0.5 mv/cm
39 centimeters	19.6 to 39 millivolts	1 mv/cm
39 centimeters	40 to 78 millivolts	2 mv/cm
39 centimeters	79 to 195 millivolts	5 mv/cm
39 centimeters	196 to 390 millivolts	10 mv/cm
39 centimeters	391 to 780 millivolts	20 mv/cm
39 centimeters	0.79 to 1.95 volts	0.05 v/cm
39 centimeters	1.96 to 3.9 volts	0.1 v/cm
39 centimeters	4 to 7.8 volts	0.2 v/cm
39 centimeters	7.9 to 19.5 volts	0.5 v/cm
39 centimeters	19.6 to 39 volts	1 v/cm
39 centimeters	40 to 390 volts	10 v/cm
39 centimeters	391 to 780 volts	20 v/cm

TABLE 3-3. Y-RANGE SWITCH SIGNAL INPUT SETTINGS FOR STANDARD MODELS

WIDTH OF CHART PAPER	MAXIMUM AMPLITUDE OF INPUT SIGNAL	RANGE SWITCH SETTING
10 inches	0 to 5 millivolts	0.5 mv/in
10 inches	6 to 10 millivolts	1 mv/in
10 inches	11 to 20 millivolts	2 mv/in
10 inches	21 to 50 millivolts	5 mv/in
10 inches	51 to 100 millivolts	10 mv/in
10 inches	101 to 200 millivolts	20 mv/in
10 inches	201 to 500 millivolts	50 mv/in
10 inches	0.51 to 1 volt	0.1 v/in
10 inches	1.1 to 2 volts	0.2 v/in
10 inches	3 to 5 volts	0.5 v/in
10 inches	6 to 10 volts	1 v/in
10 inches	11 to 100 volts	10 v/in
10 inches	101 to 200 volts	20 v/in
10 inches	201 to 500 volts	50 v/in

TABLE 3-4. Y-RANGE SWITCH SIGNAL INPUT SETTINGS FOR METRIC MODELS

WIDTH OF CHART PAPER	MAXIMUM AMPLITUDE OF INPUT SIGNAL	RANGE SWITCH SETTING
28 centimeters	0 to 5.6 millivolts	0.2 mv/cm
28 centimeters	5.7 to 14 millivolts	0.5 mv/cm
28 centimeters	15 to 28 millivolts	1 mv/cm
28 centimeters	29 to 56 millivolts	2 mv/cm
28 centimeters	57 to 140 millivolts	5 mv/cm
28 centimeters	141 to 280 millivolts	10 mv/cm
28 centimeters	281 to 560 millivolts	20 mv/cm
28 centimeters	0.57 to 1.4 volts	0.05 v/cm
28 centimeters	1.5 to 2.8 volts	0.1 v/cm
28 centimeters	2.9 to 5.6 volts	0.2 v/cm
28 centimeters	5.7 to 14 volts	0.5 v/cm
28 centimeters	15 to 28 volts	1 v/cm
28 centimeters	29 to 280 volts	10 v/cm
28 centimeters	281 to 560 volts	20 v/cm

3.7.2 Continued

STEP 10. Place the PEN switch in the UP position. Observe that the pen carriage moves horizontally in response to changes in amplitude of the X-axis signal and the pen assembly moves vertically along the pen carriage in response to changes in amplitude of the Y-axis signal.

STEP 11. Short the X-axis and Y-axis input terminals together (red to black).

STEP 12. Turn the X-ZERO control until the tip of the pen is aligned with the point on the chart that is to represent zero X-axis input signal.

NOTE

Placing the PEN switch in in RECORD position will lower the pen tip to the paper for more accurate alignment. The PEN switch should be returned to the UP position after the zero control has been adjusted.

STEP 13. Turn the Y-ZERO control until the tip of the pen is aligned with the point on the chart that is to represent zero Y-axis input signal.

STEP 14. Remove the shorts across the X-axis and Y-axis input terminals. If less than the indicated horizontal excursion of the pen carriage is desired, rotate the X-axis variable attenuator control CW until the desired X-axis excursion is obtained. If less than the indicated vertical excursion of the pen assembly is desired, rotate the Y-axis variable attenuator control CW until the desired pen travel is obtained.

STEP 15. Turn the PEN switch to RECORD and observe the recorded trace.

3.7.3 Time-Y Mode of Operation (Model F-80A Only)

For Time-Y operation, proceed as follows:

STEP 1. Turn the POWER switch to OFF and the PEN switch to STANDBY.

3.7.3 Continued

STEP 2. Make sure that the pen is filled with ink and is properly seated. See paragraph 3.4.

STEP 3. Determine that the recorder is connected to a proper power source. See paragraph 3.2.

STEP 4. Turn the mode switch to MV/V.

STEP 5. Turn the POWER switch to ON and observe that the power indicator light comes on.

NOTE

If the indicator lamp does not light, turn the POWER switch to OFF, and check the fuse mounted at the rear of the recorder.

STEP 6. Turn the POWER switch to VACUUM. Place a sheet of chart paper on the platen. Note that the vacuum holds the chart in place, but that the paper can be repositioned with the vacuum on. Align the left-hand and bottom edges of the chart paper with guide strips on the platen.

STEP 7. Determine that the signal to be monitored is properly connected to the Y-axis signal input terminals of the recorder. See paragraph 3.5.

STEP 8. Using Table 3-5 or 3-6 as a guide, select the time base desired using the X-RANGE switch.

W A R N I N G

WHEN OPERATING IN THE TIME-Y MODE, THERE MUST BE NO CONNECTION TO THE X-AXIS INPUT TERMINALS.

STEP 9. Rotate the Y-axis variable attenuator control (inner knob of range switch) fully CCW and the Y-axis range switch (outer knob) to a position corresponding to the maximum amplitude of the signal voltage connected to the Y-axis input terminals. Table 3-3 or 3-4 can be used as a guide.

TABLE 3-5. X-RANGE SWITCH TIME BASE SETTINGS FOR STANDARD MODELS

WIDTH OF CHART PAPER	LENGTH OF TIME FOR ONE SWEEP	RANGE SWITCH SETTING
15 inches	7.5 seconds	0.5 sec/in
15 inches	15 seconds	1 sec/in
15 inches	30 seconds	2 sec/in
15 inches	75 seconds	5 sec/in
15 inches	150 seconds	10 sec/in
15 inches	300 seconds	20 sec/in
15 inches	750 seconds	50 sec/in

TABLE 3-6. X-RANGE SWITCH TIME BASE SETTINGS FOR METRIC MODELS

WIDTH OF CHART PAPER	LENGTH OF TIME FOR ONE SWEEP	RANGE SWITCH SETTING
39 centimeters	7.8 seconds	0.2 sec/cm
39 centimeters	19.5 seconds	0.5 sec/cm
39 centimeters	39 seconds	1 sec/cm
39 centimeters	78 seconds	2 sec/cm
39 centimeters	195 seconds	5 sec/cm
39 centimeters	390 seconds	10 sec/cm
39 centimeters	780 seconds	20 sec/cm

3.7.3 Continued

STEP 10. Turn the PEN switch to UP.

STEP 11. Short the X-axis and Y-axis input terminals together (red to black).

STEP 12. Turn the X-ZERO control until the tip of the pen is aligned with the point on the chart that is to represent zero time.

NOTE

Placing the PEN switch in the RECORD position will lower the pen tip to the paper for more accurate alignment. The PEN switch should be returned to the UP position after the zero control has been adjusted.

STEP 13. Turn the Y-ZERO control until the tip of the pen is aligned with the point on the chart that is to represent zero Y-axis input signal.

STEP 14. Turn the mode switch to SWEEP, and observe that the pen carriage moves from left to right at a constant rate. Further observe that the carriage stops and the pen lifts automatically at the extreme right-hand limit of travel.

STEP 15. To return the carriage to zero, turn the mode switch to RESET.

STEP 16. Remove the shorts across the X-axis and Y-axis input terminals. Turn the PEN switch to RECORD and observe the recorded trace.

SECTION 4
SERVICE AND MAINTENANCE

4.1 GENERAL

Maintenance of Series F-80A recorders should be performed only by a person experienced in servicing electromechanical devices having transistorized circuitry. If no such person is available, the recorder can be sent to the factory, or to a factory representative, for service.

4.2 FIELD AND FACTORY SERVICE

Should it become necessary to return an instrument for service, please observe the following:

1. Remove pen assembly, chart paper, and power cord from recorder. Do not send with equipment.

2. The original or another suitable container should be used and the recorder should be surrounded on all six sides by about four inches of packing material.

3. Recorders should be shipped by Railway Express, air freight, or motor freight, PREPAID, to the nearest Varian Recorder Sales Representative or to:

   Varian Associates
   611 Hansen Way
   Palo Alto, California 94303

   Attn: Recorder Division
   Service Manager

4. Each recorder should be accompanied by a full description of difficulties encountered, model and serial number of recorder, date of purchase, and name of representative from whom the recorder was purchased.

4.2 Continued

NOTE

Varian has an established policy that equipment sent in for service will be completely checked in addition to correcting the cause of the malfunction. Equipment shipped to the user will meet the specifications under which it was originally sold. When it appears that it will be unusually expensive to bring an out of warranty instrument up to specifications, the user will be contacted for specific instructions.

4.3 PREVENTIVE MAINTENANCE

4.3.1 Pen

The recorder pen must be kept clean for proper functioning. Inks are water-soluble. For cleaning, water should be forced through the pen system. Cold water is normally satisfactory, but if the pen is obstructed, liquid detergent in warm water may be used and a piece of pen cleaning wire may be drawn through the pen system to dislodge the obstruction. The pen filler furnished with the recorder may be used as an aid in cleaning the pen. A small piece of plastic tubing installed between the pen filler and the pen tip may be used as a connection when drawing or feeding water through the pen. To assure maximum performance, the pen should always be cleaned immediately after use.

To clean the ink reservoir, fill it with warm water, rinse with cold water, and allow to air dry.

4.3.2 Carriage Rods

To maintain smooth operation, carriage rods must be kept clean. A small amount of light machine oil may be applied as often as required, and the rods wiped with a clean, lint-free cloth.

4.4 LUBRICATION

4.4.1 Servo Motors

The servo motors in Series F-80A recorders require lubrication every three months. Disassemble the recorder, following the procedure given in paragraph

4.4.1 Continued

4.7 - DISASSEMBLY. Place one or two drops of motor oil (furnished with the recorder) in each of the red-painted holes in the servo motors. DO NOT OVERLUBRICATE.

4.4.2 Fan

For best, long-life performance, the fan should be lubricated at least once a year. In installations of unusually severe service or environment, oil more frequently. The oil and a clean pen filler furnished with the recorder may be used.

4.4.2.1 60 Hz Fans

Instructions for oiling 60 Hz fans are as follows:

STEP 1. Draw a small amount of oil into the pen filler. Position the pen filler at an angle of 45° to the seal on the label.

STEP 2. Pierce the label and concealed self-sealing rubber cap under the label in the letter "O" in oil.

STEP 3. Depress the plunger firmly until a few drops of oil have entered the fan motor.

STEP 4. Withdraw the pen filler and wipe off excess oil.

STEP 5. Return excess oil from the pen filler to the original container. Clean the pen filler thoroughly with soap and water if it is to be used for any other purpose, such as pen cleaning.

4.4.2.2 50 Hz Fans

Instructions for oiling 50 Hz fans are as follows:

STEP 1. Draw a small amount of oil into the pen filler. Position the pen filler at an angle of 45° to the oiling location on the fan.

STEP 2. Follow Steps 3 through 5 of paragraph 4.4.2.1.

4.5 SEMICONDUCTOR TECHNIQUES AND PRECAUTIONS

Transistors, though similar in many ways to vacuum tubes, require different techniques in troubleshooting. The essential differences lie in the fact that transistors are inherently low-impedance devices operating on low voltages and small currents. Polarities depend on the type of transistor. PNP types normally require negative supply voltages. NPN types normally require positive supply voltages. Connecting the wrong voltage polarity is a sure way to break down the transistor junction.

If there does not appear to be a voltage drop between emitter and collector, it can be assumed that this junction is shorted. However, it is best to turn off all voltages in the system and make a resistance check before removing the transistor from the circuit.

When checking the base-to-emitter voltage, consider that this voltage should be greater than normal if the transistor is saturated and less than normal for a cut-off condition. A saturated transistor is characterized by a low emitter-to-collector voltage. A corresponding base-to-emitter voltage would be larger than normal. However, if the transistor appears to be saturated and the base-to-emitter voltage is lower than normal, or of the reverse polarity, a defective base-to-collector junction and excessive resultant leakage is indicated.

When making gain checks in transistor circuits, bear in mind that transistor voltage gains vary a great deal more than vacuum tube gains and that transistor failures are usually due to a junction breakdown, usually a "go" or "no go" situation. Another complication is the use of dc feedback for temperature stabilization. When one voltage in the circuit is abnormal, all circuit voltages may appear to be abnormal.

With all types of semiconductors, proper soldering techniques must be observed to avoid overheating the semiconductor junctions. To minimize excessive temperatures, (1) the semiconductor leads should be pre-tinned, (2) the terminal to which the lead is to be connected should be thoroughly cleaned, (3) a heat sink between the transistor or diode and the joint to be made should be used to draw heat away from the semiconductor, (4) a well-tinned soldering iron should be used, and (5) the connection should be made as quickly as possible. An alligator clip or a pair of long-nose pliers make an excellent heat sink. The heat sink should be clamped to the lead as near to the diode or transistor as possible.

When applying signal voltages from a signal generator, it is essential that inputs be kept low in amplitude (under 1 v preferably) to avoid exceeding inverse voltage breakdown limits of the transistor junction. Since transistors fail immediately when voltage breakdown values are exceeded, it is also essential that no transients be present in the transistor voltage supply.

4.5 Continued

A resistance check between transistor leads will indicate a defective transistor when there has been a junction breakdown. A junction can break down between any two connections, without necessarily being shorted to the other element. A junction break down is the usual case with transistors that are not functioning properly. Care should be taken when using a multimeter in checking for shorts to avoid breaking down the transistor junction with excessive current. A 100-ohm resistor should be inserted in series with the multimeter leads and 100 ohms deducted from the multimeter reading.

The circuit between any two elements of a transistor is the equivalent of a diode. Resistance checks made with the transistor out of the circuit will show a very high resistance in one direction, usually appearing as an open when measured with a multimeter, and a much lower resistance in the reverse direction.

To test a transistor still connected to the circuit, check voltages at base, emitter and collector connections.

Voltage measurements in a transistor circuit can be misleading. If a VTVM with a grounded connection is used, and voltages are measured from ground, there will be very little difference between the base and emitter readings. The base-to-emitter voltage is usually only a few tenths of a volt. This voltage is best measured directly by a multimeter or by a VTVM that is battery powered and has no power connection to ground.

4.6 TROUBLESHOOTING

4.6.1 General

If the recorder does not function properly, proceed as follows:

STEP 1. Read Section 3 of this manual carefully. Determine that (1) the chart paper and ink were properly installed, (2) the recorder is connected to a proper source of primary power, (3) the signal inputs are properly connected to the recorder, and (4) the operating controls are in appropriate positions.

STEP 2. If the pen carriage does not move in response to changing input signal, partially disassemble the recorder (see paragraph 4.7) and consider the following general categories:

(a) Broken or loose cable.
(b) Defective transistor, resulting in low gain or no gain.

4.6.1 Continued

(c) Defective chopper (with bad contacts), resulting in a steady deflection of the pen to the right or left.
(d) Defective chopper (with an open winding), resulting in no servo control and no apparent signal response.
(e) Defective feedback potentiometer, resulting in erratic pen movement.
(f) Defective power supply capacitors, resulting in damaged power diodes.
(g) Defective Zener diodes, resulting in loss of reference voltage or amplifier voltage.

NOTE

The schematics in Section 6 can be used as guides when troubleshooting.

4.6.2 Physical Inspection

STEP 1. Disassemble the recorder following the procedure outlined in paragraph 4.7.

STEP 2. Check that all cables are properly and tightly aligned on pulleys without interference.

STEP 3. Press the solenoid plunger down. The Y carriage should rotate to place the pen on the chart paper and then return to start when the plunger is released.

STEP 4. Servo motor gears must be engaged, with a slight backlash.

4.7 DISASSEMBLY

STEP 1. Turn the POWER switch to OFF and the PEN switch to STANDBY. Disconnect the power cord from the recorder.

STEP 2. Remove all leads from signal input terminals.

STEP 3. Remove the case top by removing four 10-32 flat head screws on the top surface of the recorder.

4.7 Continued

C A U T I O N

DO NOT LIFT THE RECORDER BY MEANS OF THE CARRIAGE OR THE RODS ON WHICH THE CARRIAGE SLIDES.

STEP 4. If the recorder is rack-mounted, support the recorder and remove the four 10-32 pan head screws (or equivalent) which secure it to the equipment rack.

STEP 5. If the recorder is a bench-top model, remove the case bottom by removing four 10-32 pan head screws on the top surface of the frame.

STEP 6. Remove the bottom plate assembly by removing four 8-32 pan head screws which extend from the bottom of the plate into the frame legs. Three electrical connections must be broken before separation is complete. The control panel assembly is included with the bottom plate assembly. The recorder is now separated into the translation assembly and the bottom plate assembly. All mechanical and electronic repairs can be made at this stage. The recorder can be operated in this condition by using a Varian Service Cable Kit, Part No. 972-086.

4.8 CALIBRATION

Each recorder is completely calibrated before shipment. The following procedures can be used to check the calibration upon receipt of the unit or to recalibrate the recorder after maintenance. The case top must be removed (see paragraph 4.7) before attempting these calibration procedures.

4.8.1 X and Y Channel Adjustments

STEP 1. Follow Steps 1 through 6, paragraph 3.7.2.

STEP 2. Short the X-axis and Y-axis input terminals together (red to black).

STEP 3. Turn the X-ZERO control until the tip of the pen is aligned with the left margin of the chart paper.

4.8.1 Continued

NOTE

Placing the PEN switch in the RECORD position will lower the pen tip to the paper for more accurate alignment. The PEN switch should be returned to the STANDBY position after the zero control has been adjusted.

STEP 4. Turn the Y-ZERO control until the tip of the pen is aligned with the bottom margin of the chart paper.

STEP 5. Rotate the X-axis variable attenuator control (inner knob of range switch) fully CCW and the X-axis range switch (outer knob) to the 0.5 millivolt per inch (standard model) or 0.2 millivolt per centimeter (metric model) position.

STEP 6. Rotate the Y-axis variable attenuator control fully CCW and the Y-axis range switch to the 0.5 millivolt per inch (standard model) or 0.2 millivolt per centimeter (metric model) position.

STEP 7. Remove the shorts across the X-axis and Y-axis signal input terminals.

STEP 8. Connect a dc test voltage of 7.5 millivolts (standard model) or 7.8 millivolts (metric model) between the red (+) or black (-) X-axis signal input terminals.

STEP 9. Connect a dc test voltage of 5 millivolts (standard model) or 5.6 millivolts (metric model) between the red (+) and black (-) Y-axis signal input terminals.

STEP 10. Turn the PEN switch to UP and observe that the pen assembly moves to the upper right-hand corner of the platen.

STEP 11. Turn the X-axis gain and Y-axis gain adjustments as far CW as possible without causing oscillation of the pen.

STEP 12. Turn the X-axis span adjustment until the tip of the pen is aligned with the right margin of the chart paper.

4.8.1 Continued

NOTE

Placing the PEN switch in the RECORD position will lower the pen tip to the paper for more accurate alignment. The PEN switch should be returned to the UP position after the span has been adjusted.

STEP 13. Turn the Y-axis span adjustment until the tip of the pen is aligned with the upper margin of the chart paper.

STEP 14. Repeat Steps 11 through 13 until all interaction is eliminated.

STEP 15. Rotate the X-range switch to the 1 millivolt per inch (standard model) or 0.5 millivolt per centimeter (metric model) position.

STEP 16. Rotate the Y-range switch to the 1 millivolt per inch (standard model) or 0.5 millivolt per centimeter (metric model) position.

STEP 17. Observe that the pen comes to rest approximately in the center of the chart paper. Turn the PEN switch to RECORD.

STEP 18. Short the X-axis signal input terminals. Observe that the pen carriage moves to the left margin of the chart paper and draws a clear trace as it goes.

STEP 19. Turn the Y-ZERO control slightly CW until the pen moves upward about one small division on the chart paper.

STEP 20. Remove the short from the X-axis signal input terminals and observe the recorded trace.

NOTE

Ideally, the trace drawn in Step 20 extends as far to the right but no farther than the trace drawn in Step 18.

4.8.1 Continued

STEP 21. If there is evidence of overshoot, turn the X-axis damping adjustment slightly CW; then, repeat Steps 18 through 20.

STEP 22. If there is evidence of undershoot, turn the X-axis damping adjustment slightly CCW; then, repeat Steps 18 through 20.

STEP 23. Short the Y-axis signal input terminals. Observe that the pen assembly moves toward the bottom margin of the chart paper and draws a clear trace as it goes.

STEP 24. Turn the X-ZERO control slightly CW until the pen moves to the right about one small division on the chart paper.

STEP 25. Remove the short from the Y-axis signal input terminals and observe the recorded trace.

NOTE

Ideally, the trace drawn in Step 25 extends as far up, but no farther than the trace drawn in Step 23.

STEP 26. If there is evidence of overshoot, turn the Y-axis damping adjustment slightly CW; then, repeat Steps 23 through 25.

STEP 27. If there is evidence of undershoot, turn the Y-axis damping adjustment slightly CCW; then, repeat Steps 23 through 25.

STEP 28. Remove the test voltages from the X-axis and Y-axis signal input terminals.

4.8.2 Time Base Calibration Procedure

Perform the X and Y Channel Adjustments outlined in paragraph 4.8.1, then proceed as described below. Refer to Figure 4-1 for location of adjustments. Use the black binding post terminal of the Y-axis signal input as the electrical ground when making the voltage and resistance measurements specified in this procedure.

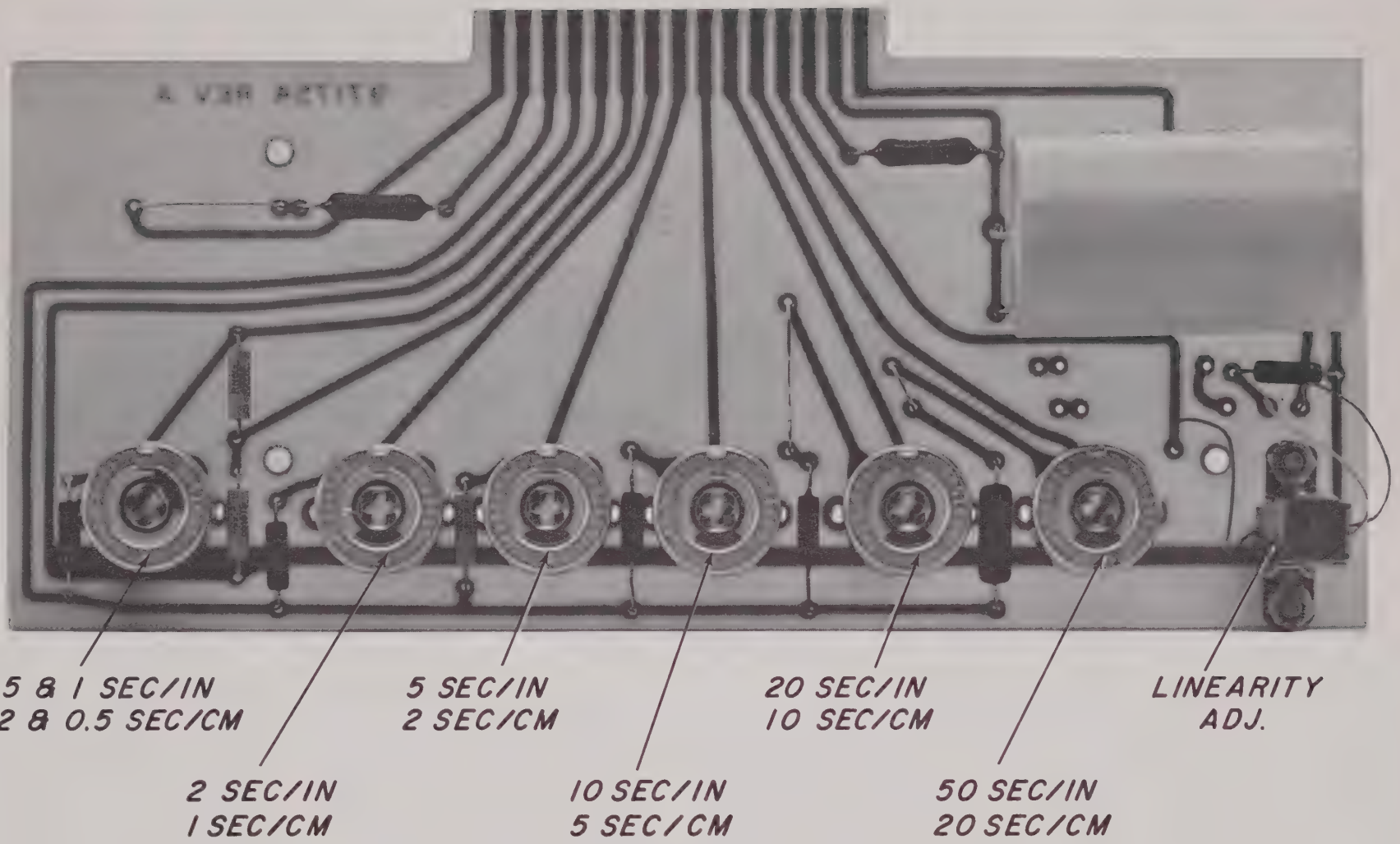

0.5 & 1 SEC/IN
0.2 & 0.5 SEC/CM
2 SEC/IN
1 SEC/CM
5 SEC/IN
2 SEC/CM
10 SEC/IN
5 SEC/CM
20 SEC/IN
10 SEC/CM
50 SEC/IN
20 SEC/CM
LINEARITY
ADJ.

FIGURE 4-1

4.8.2 Continued

W A R N I N G

WHEN OPERATING IN THE TIME-Y MODE, THERE MUST BE NO CONNECTION TO THE X-AXIS INPUT TERMINALS.

STEP 1. Obtain a VTVM, John Fluke DC VTVM Model 801 or equivalent, and a square-wave generator, Hewlett-Packard Function Generator 202A or equivalent. In addition, insulated-shaft Phillips-head and slot-head screwdrivers are required.

STEP 2. Separate the translation assembly from the bottom plate assembly. See paragraph 4.7.

STEP 3. Turn the POWER switch to VACUUM, the outer knob of the X-RANGE switch to the 0.5 sec/in (standard model) or 0.2 sec/cm (metric model) position, the outer knob of the Y-RANGE switch to the 0.5 sec/in (standard model) or 0.2 sec/cm (metric model) position, the PEN switch to STANDBY, and the mode switch to the MV/V position.

W A R N I N G

USE EXTREME CAUTION WHEN ADJUSTING THE TIME BASE POTENTIOMETERS SINCE MODE SWITCH TERMINALS, WHICH ARE CONNECTED TO THE PRIMARY POWER LINE, ARE EXPOSED.

STEP 4. Connect the VTVM between the armature contact of deck C of the X-RANGE switch and electrical ground (black binding post of Y-axis signal input). Adjust the time base potentiometers for given X-RANGE switch positions to produce a voltage reading on the VTVM according to Table 4-1.

TABLE 4-1

STANDARD MODEL		METRIC MODEL		VOLTAGE READING
X-RANGE SWITCH POSITION	ADJUSTED POT	X-RANGE SWITCH POSITION	ADJUSTED POT	
0.5 sec/in	0.5 and 1 sec/in	0.2 sec/cm	0.2 and 0.5 sec/cm	6.2 volts
2 sec/in	2 sec/in	1 sec/cm	1 sec/cm	1.55 volts
5 sec/in	5 sec/in	2 sec/cm	2 sec/cm	0.62 volt
10 sec/in	10 sec/in	5 sec/cm	5 sec/cm	0.31 volt
20 sec/in	20 sec/in	10 sec/cm	10 sec/cm	0.155 volt
50 sec/in	50 sec/in	20 sec/cm	20 sec/cm	0.062 volt

STEP 5. Turn the POWER switch to OFF. Disconnect the VTVM from the armature contact of the X-RANGE switch, and reassemble the translation assembly to the bottom plate assembly using the reverse of the procedure followed in Step 2.

STEP 6. Turn the POWER switch to VACUUM and place a sheet of chart paper on the platen. Align the left-hand and bottom edges of the paper with the guide strips on the platen.

STEP 7. Turn the mode switch to RESET and the PEN switch to UP.

STEP 8. Place the outer knob of the X-RANGE switch in the 0.5 sec/in (standard model) or 0.2 sec/cm (metric model) position and turn the mode switch to SWEEP. Observe that the pen carriage moves across the platen from the left margin and stops at the right margin.

STEP 9. Turn the mode switch to RESET.

STEP 10. Connect the square wave generator to the Y-axis signal input terminals. Place the outer knob of the Y-RANGE switch in an appropriate position for the output level of the signal generator. Set the generator to produce a square wave at 1 Hz (standard model) or 1.25 Hz (metric model) of an amplitude that causes approximately one inch of pen assembly deflection.

4.8.2 Continued

STEP 11. Turn the PEN switch to RECORD and the mode switch to SWEEP.

STEP 12. Observe that the pen traces 7-1/2 cycles over 15 $\pm$ 0.45 inches of the chart (0.45 inch = 4-1/2 small divisions) if the unit is a standard model, or that the pen traces 9-3/4 cycles over 39 $\pm$ 1.17 cm of the chart (1.17 = 1 large and 1.7 small divisions) if the unit is a metric model. In addition, the width of the final cycle should be within 5% of the first cycle. Turn the mode switch to RESET.

STEP 13. If the recorded trace is not within limits, adjust the linearity control and repeat Steps 11 and 12 until the final cycle width is within 5% of the first cycle width. Now, adjust the 0.5 and 1 sec/in (standard model) or 0.2 and 0.5 sec/cm (metric model) potentiometer until the recorded trace is within limits. The Y-ZERO control can be used to position the pen over a clean portion of the chart after each test cycle.

STEP 14. In a similar manner (steps 9 thru 13) test for and adjust the recorded trace for each of the other positions of the X-RANGE switch according to Table 4-2.

TABLE 4-2

SQUARE WAVE FREQUENCY	STANDARD MODEL		METRIC MODEL	
	X-RANGE SWITCH POSITION	ADJUSTED POT	X-RANGE SWITCH POSITION	ADJUSTED POT
0.5 Hz	1 sec/in	0.5 and 1 sec/in	0.5 sec/cm	0.2 and 0.5 sec/cm
0.25 Hz	2 sec/in	2 sec/in	1 sec/cm	1 sec/cm
0.10 Hz	5 sec/in	5 sec/in	---	---
0.125 Hz	---	---	2 sec/cm	2 sec/cm
0.05 Hz	10 sec/in	10 sec/in	5 sec/cm	5 sec/cm
0.025 Hz	20 sec/in	20 sec/in	10 sec/cm	10 sec/cm
0.010 Hz	50 sec/in	50 sec/in	---	---
0.0125 Hz	---	---	20 sec/cm	20 sec/cm

4.9 RESTRINGING PEN DRIVE CABLES

All of the parts necessary for restringing the X and Y cables of Series F-80A Recorders are contained in Varian Cable Kit No. 907-780. The kit can be obtained from Varian Recorder Representatives or from the factory.

Duck-bill pliers, a Phillips screwdriver, an ohmmeter (0 to 500 ohms), and masking tape are the items required that are not supplied in the kit. It is recommended that the Y-cable procedure be performed first. The recorder should be disassembled following instructions in paragraph 4.7.

4.9.1 Parts Included in Kit, Varian Part No. 907-780

Varian Part Number	Description	Quantity
907-528	Y-axis cable, 6 ft.	2
907-528	X-axis cable, 13 ft.	1
907-532	Cable terminal	4
907-271	Cable spring	4
29-899-855	Allen wrench, 0.050"	1
29-899-861	Allen wrench, 3/32"	1
87-300-066	Restringing Instructions	1

4.9.2 Y-Cable Stringing

Refer to Figure 4-2 during this procedure.

STEP 1. Place the X carriage in the center of the platen at a point where the distance from the left-hand side of the Y-rod cover to the left-hand edge of the left-hand X-rod holder is 9-1/2 inches. Using masking tape, tape both ends of the carriage to the X rods at the X housing.

STEP 2. Place the magnetic pen holder assembly in the center of the platen at a point where the distance from the center of the assembly to the front X housing is 6-1/2 inches. Place masking tape around the Y rod and the Y-rod cover on either side of the holder assembly so that it cannot move.

STEP 3. Turn the recorder upside-down, mounting the platen on supports so that the carriage will not be damaged. With the Y-drive axis facing the technician, remove both of the old Y drive cables, if necessary. Remove the Y-limit switch actuating mechanism. Unhook the centering spring, loosen the clamp, and pull the parts off the shaft. Note the order and arrangement of the parts.

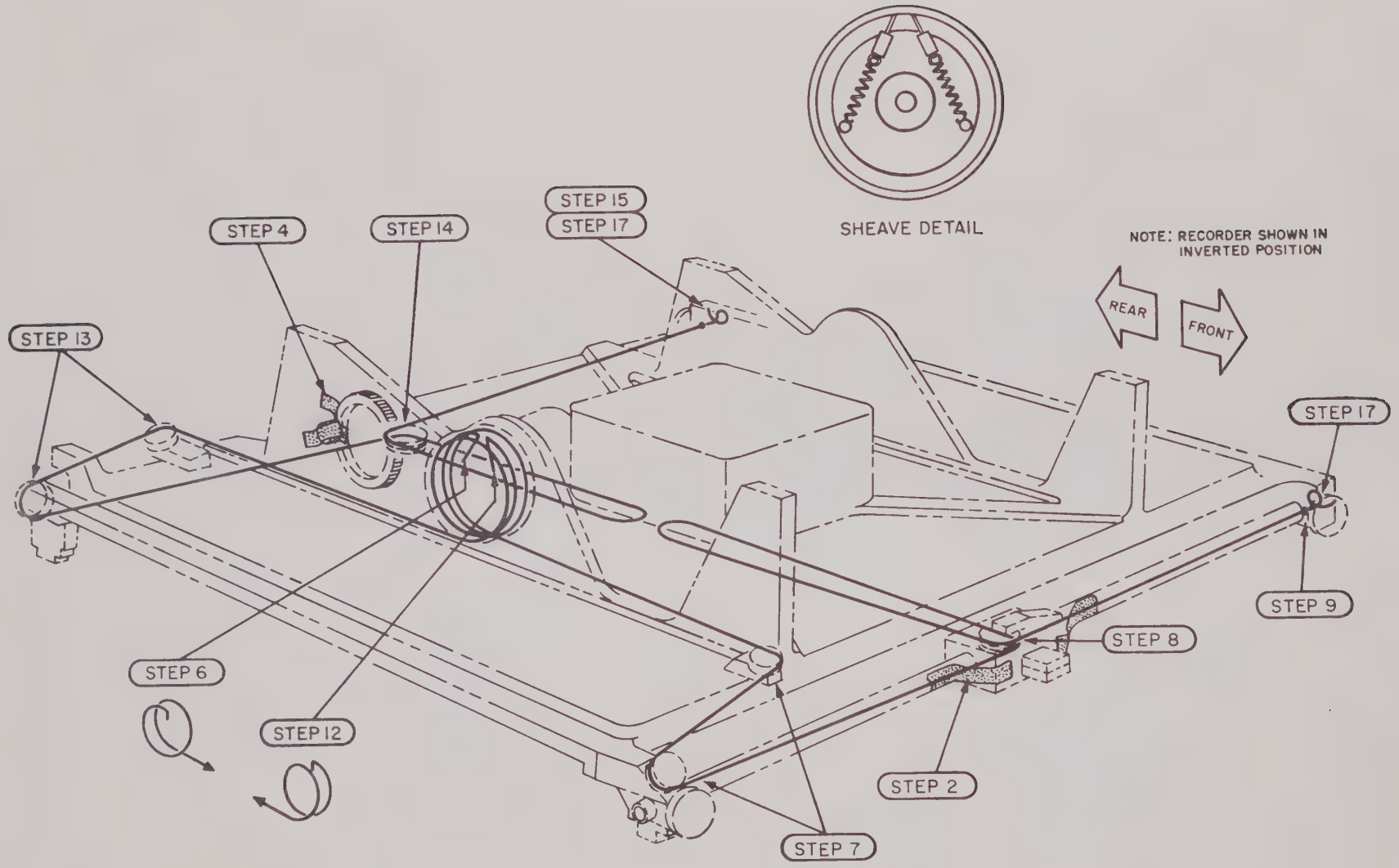

SHEAVE DETAIL
NOTE: RECORDER SHOWN IN INVERTED POSITION
REAR
FRONT
STEP 4
STEP 14
STEP 15
STEP 17
STEP 13
STEP 17
STEP 9
STEP 8
STEP 6
STEP 12
STEP 2
STEP 7

FIGURE 4-2

4.9.2 Continued

STEP 4. Rotate the sheave on the Y-axis slidewire fully CW, then reverse 1-1/2 turns (holes in the sheave should face upward). Tape the Y-axis motor and reduction gears together and to the casting so that the sheave cannot move.

NOTE

When installing a new slidewire, rotate the shaft fully CW and install the sheave with the holes facing down so that when the slidewire is reversed 1-1/2 turns, the holes will face upward.

STEP 5. Select one of the 6 ft. pieces of cable in the kit and pass one end through the left-hand hole in the Y-axis slidewire sheave, outside to inside. Insert the cable through a cable terminal, then through the eye of a cable spring, then back through the cable terminal, forming a loop. Pull the spring snug to the terminal and flatten the terminal with duck-bill pliers. Hook the free eye of the spring over the left-hand pin in the slidewire sheave.

NOTE

Cabling must be kept taut at all times.

STEP 6. Pull the cable until the spring is slightly extended, then wrap the cable 1-1/2 turns CCW around the Y-axis slidewire sheave. Wrap each turn farther toward the rear of the sheave (away from the technician).

STEP 7. As shown in Figure 4-2, wrap the cable 1/4 turn CW around the guide pulley at the right-hand side of the casting, then 1/2 turn CCW around the guide pulley at the lower right-hand front of the casting.

4.9.2 Continued

STEP 8. Turn the recorder over with the front of the assembly facing the technician. Wrap the cable 1/4 turn CW around the top pulley of the front X housing, then 1/2 turn CW around the front pulley of the pen holder assembly, then back 1/4 turn CW around the lower pulley of the front X housing.

STEP 9. Insert the cable through the hole in the casting at the left-hand side of the recorder. Loosen the Phillips screw at the left-hand side of the casting. Wrap the cable a full turn around the screw between the flat washers, and tighten the screw.

STEP 10. Turn the recorder upside-down and mount as in Step 3. The Y axis should again be facing the technician.

STEP 11. Select the other 6 ft. piece of cable in the kit and pass one end through the right-hand hole in the Y-axis slidewire sheave, outside to inside. Insert the cable through a cable terminal, then through the eye of a cable spring, then back through the cable terminal, forming a loop. Pull the spring snug to the terminal and flatten the terminal with duck-bill pliers. Hook the free eye of the spring over the right-hand pin in the slidewire sheave.

NOTE

Cabling must be kept taut at all times.

STEP 12. Pull the cable until the spring is slightly extended, then wrap the cable 1-1/2 turns CW around the Y-axis slidewire sheave. Wrap each turn farther toward the front of the sheave (toward the technician). Cabling must not overlap at any point on the sheave.

STEP 13. As shown in Figure 4-2, wrap the cable 1/4 turn CCW around the guide pulley at the left-hand side of the casting, then 1/2 turn CW around the guide pulley at the lower left-hand front of the casting.

STEP 14. Turn the recorder over with the rear of the assembly facing the technician. Wrap the cable 1/4 turn CCW around the top pulley of the rear X housing, then 1/2 turn CCW around the rear pulley of the pen holder assembly, then back 1/4 turn CCW around the lower pulley of the rear X housing.

4.9.2 Continued

STEP 15. Insert the cable through the hole in the casting at the right-hand side of the recorder. Loosen the Phillips screw at the right-hand side of the casting. Wrap the cable a full turn around the screw between the flat washers, and tighten the screw.

STEP 16. Release the magnetic pen holder assembly. Slide the assembly its full travel in both directions, checking to be sure that all cable strands on sheaves are parallel.

STEP 17. Adjust tension on the springs in the Y sheave for 1/8" to 3/16" extension by adjusting the cable tie point(s) on either side of the casting.

STEP 18. Position the pen holder assembly against the upper stop. Refer to Figure 5-2 and turn the recorder upside-down and replace the parts removed in Step 4. From the sheave outward, the order of parts should be:

(a) the actuator and bearing assembly (with the bearing shoulder against the sheave),
(b) a teflon washer,
(c) the actuator with the hook (hook bent out),
(d) another washer,
(e) the actuator with the straight extension,
(f) the third washer,
(g) the clamp (with the pin facing inward).

STEP 19. Before tightening the clamp, position the parts as follows:

(a) Set the actuator against the right-hand limit switch so that the switch is operated but there is overtravel remaining.
(b) Against the pin in this actuator, position clockwise in the following order: (1) the hook actuator, (2) the straight extension actuator, and (3) the clamp pin.
(c) With these parts in contact, tighten the clamp on the shaft. The clamp should be positioned axially on the shaft so all actuators are free to rotate and still able to intercept and rotate each other.

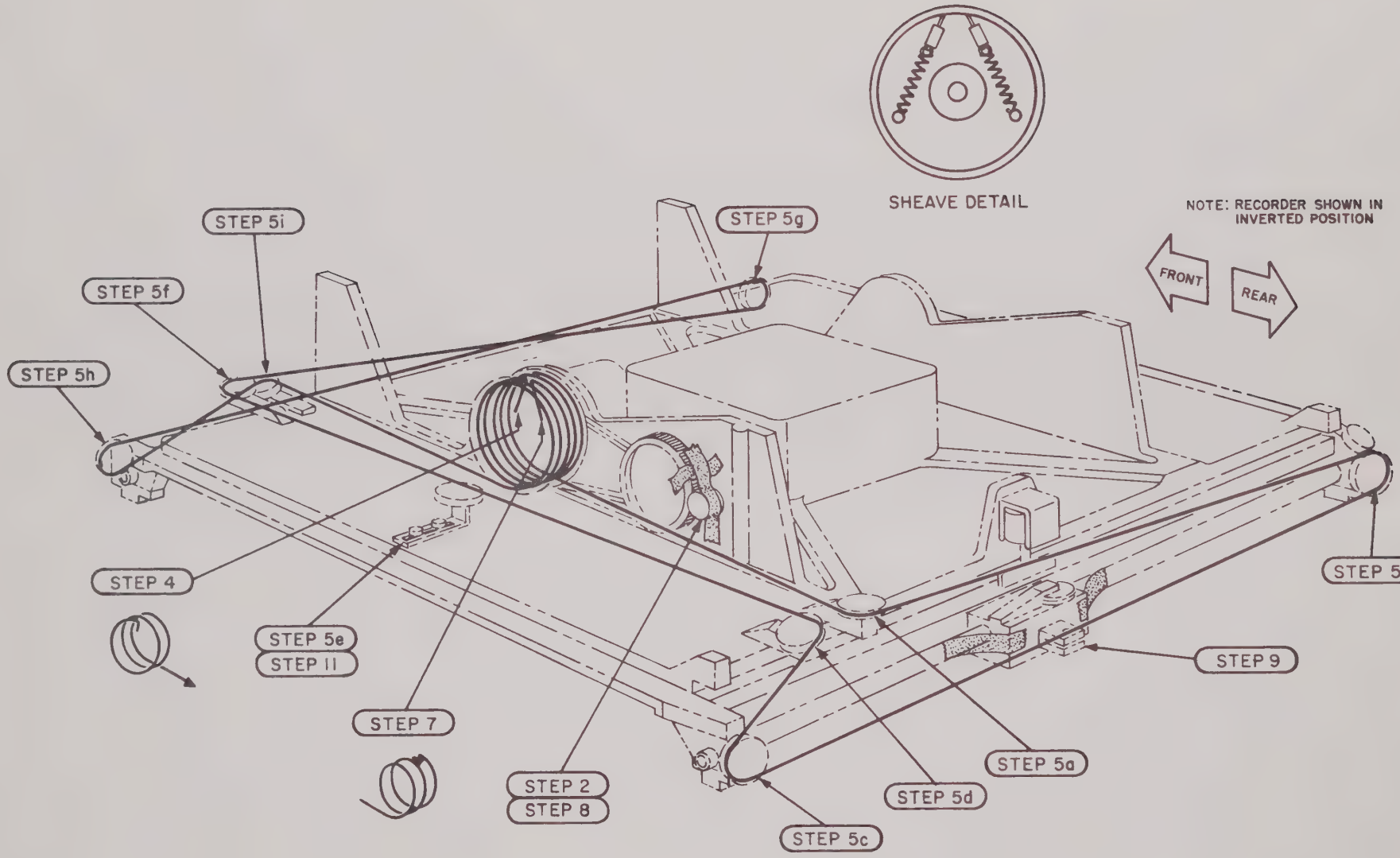

SHEAVE DETAIL
NOTE: RECORDER SHOWN IN INVERTED POSITION
FRONT
REAR
STEP 5i
STEP 5g
STEP 5f
STEP 5h
STEP 4
STEP 5e
STEP 11
STEP 7
STEP 2
STEP 8
STEP 5c
STEP 5d
STEP 5a
STEP 9
STEP 5b

FIGURE 4-3

4.9.2 Continued

STEP 20. Hook the centering spring. Move the pen holder assembly to the lower stop and check that the mechanism operates the other limit switch slightly ahead of the lower mechanical stop. Each limit switch can be repositioned on its mounting bracket if further adjustment is necessary.

4.9.3 X-Cable Stringing

Refer to Figure 4-3 during this procedure. If only the X cable is to be replaced, follow Steps 1 and 2 of paragraph 4.9.2, then proceed as follows:

STEP 1. Turn the recorder upside-down, mounting the platen on supports so the carriage will not be damaged. With the X-drive axis facing the technician, remove the old X-drive cable, if necessary.

STEP 2. Rotate the sheave on the X-axis slidewire fully CW then reverse 1-1/2 turns (holes in the sheave should face upward). Tape the X-axis motor and reduction gears together and to the casting so that the sheave cannot move.

NOTE

When installing a new slidewire, rotate the shaft fully CW and install the sheave with the holes facing down so that when the slidewire is reversed 1-1/2 turns, the holes will face upward.

STEP 3. Select the 13 ft. piece of cable in the kit and pass one end through the left-hand hole in the X-axis slidewire sheave outside to inside. Insert the cable through a cable terminal, then through the eye of a cable spring, then back through the cable terminal, forming a loop. Pull the spring snug to the terminal and flatten the terminal with duck-bill pliers. Hook the free eye of the spring over the left-hand pin in the slidewire sheave.

NOTE

Cabling must be kept taut at all times

STEP 4. Pull the cable as far as possible (until the clamp is flush with the inside circumference of the sheave and the spring is slightly extended), then wrap the cable 2-1/2 times CCW around the X-axis slidewire sheave. Wrap each turn farther toward the rear of the sheave (away from the technician).

STEP 5. As shown in Figure 4-3, wrap the cable around guide pulleys in the following order:

(a) 1/4 turn CCW at the right-hand side of the casting;
(b) 1/2 turn CW at the right-hand rear (unused guide pulley);
(c) 1/2 turn CW at the lower right-hand front;
(d) 1/4 turn CCW at the right-hand front;
(e) behind the tension pulley at the center front which must be fully extended toward the edge of the recorder facing the technician;
(f) 1/4 turn CW at the left-hand front;
(g) 1/2 turn CCW at the left-hand rear (unused guide pulley);
(h) 1/2 turn CCW at the lower left-hand front;
(i) 1/4 turn CW at the left-hand front (unused guide pulley).

STEP 6. Wrap the cable 2-1/2 turns CCW around the X-axis slidewire sheave. Keep the cabling at the front of the sheave, but with each turn farther toward the rear (away from the technician). With each turn, the end of the cable must be placed under the cabling (from Step 5) so that the strands will remain parallel. Cabling must not overlap at any point on the sheave.

STEP 7. Insert the cable through the right-hand hole in the sheave, outside to inside. Insert the cable through a cable terminal, then through the eye of a cable spring, then back through the cable terminal, forming a loop. Pull the spring snug to the terminal and hook the free eye of the spring over the right-hand pin in the slidewire sheave. Insert the end of the cable back through the right-hand hole in the slidewire sheave, inside to outside. Pull the cable until the

4.9.3 Continued

spring is extended and the terminal is flush with the inside circumference of the sheave. Flatten the terminal with pliers. Cut off all excess cable.

STEP 8. Remove masking tape from the X-axis motor and reduction gears. Turn the recorder upright.

STEP 9. Using an Allen wrench, place the cabling in the cable lock at either end of the X carriage and tighten the locks. The masking tape may now be removed from the X carriage.

STEP 10. Check that the X carriage is free to move from one side of the platen to the other and that the magnetic pen holder is free to travel the full distance over the platen. Be sure that all cable strands on sheaves are parallel.

STEP 11. Adjust tension on the springs in the X sheave for 1/8" to 3/16" extension by moving the center front cable tension pulley. After spring adjustment, the cabling in each cable lock must be adjusted (see Step 9).

4.9.4 Slidewire Calibration

STEP 1. Slide the carriage to its left-hand limit.

STEP 2. Using an ohmmeter calibrated for 0 to 500 ohms, connect ohmmeter leads between the arm of the X slidewire and the CW terminal, then take a resistance reading. It should be between 20 and 50 ohms.

STEP 3. If the resistance reading is not within this range, loosen the Allen set screws in the X sheave which hold the sheave to the slidewire shaft.

STEP 4. Holding the X carriage at its left-hand limit, turn the slidewire shaft manually until the ohmmeter reads between 20 and 50 ohms.

STEP 5. Retighten the Allen set screws in the X sheave.

STEP 6. Move the pen holder assembly to the front of the platen.

STEP 7. Using an ohmmeter calibrated for 0 to 500 ohms, connect ohmmeter leads between the arm of the Y slidewire and the CW terminal, then take a resistance reading. It should be between 20 and 50 ohms.

4.9.4 Continued

STEP 8. If the resistance reading is not within this range, loosen the screws that clamp the Y slidewire to the frame.

STEP 9. Holding the pen holder assembly at its forward limit, turn the slidewire manually until the ohmmeter reads between 20 and 50 ohms.

STEP 10. Retighten the clamp screws.

Reassemble the recorder, using the reverse of the Disassembly instructions in paragraph 4.7.

SECTION 5
PARTS LISTS

Schematic Reference	Description	Varian Part Number
B101	Servo motor, 1200 rpm, 115/30v ac, 60 Hz, single phase	943-364
B102	Servo motor, 1200 rpm, 115/30v ac, 60 Hz, single phase	943-364
B103 +	Fan, 115V, 50/60 Hz	907-279-01
B103 *	Fan, 230V, 50 Hz	907-279-02
C101	Capacitor, fixed, mylar, 5 mfd, ±20%, 200 vdcw	907-529-15
C102	Capacitor, fixed, mylar, 5 mfd, ±20%, 200 vdcw	907-529-15
C103	Capacitor, fixed, electrolytic, 5 mfd, 12 vdcw	41-506-236
C104	Capacitor, fixed, electrolytic, 5 mfd, 12 vdcw	41-506-236
C105	Capacitor, fixed, electrolytic, 5 mfd, 12 vdcw	41-506-236
C106	Capacitor, fixed, electrolytic, 5 mfd, 12 vdcw	41-506-236
C107	Capacitor, fixed, plastic, 0.047 mfd, 200 vdcw	41-724-962
C108	Capacitor, fixed, mylar, 0.22 mfd, ±20%, 400 vdcw	907-529-11
C109	Capacitor, fixed, electrolytic, 50 mfd, 50 vdcw	41-506-259
C110	Capacitor, fixed, plastic, 0.1 mfd, 200 vdcw	41-724-964
CR101	Diode, SC2	66-396-832
CR102	Diode, SC2	66-396-832
CR103	Diode, SC2	66-396-832
CR104 +	Diode, GE type 6RS5SP4B4	66-396-910
CR104 *	Diode, GE type 6RS5SP8B8	66-396-911
DS101	Lamp, cartridge, neon, amber lens	67-499-930

*+ NOTE: All components are common to both 50 Hz and 60 Hz units with the following exceptions: * 50 Hz units only; + 60 Hz units only.

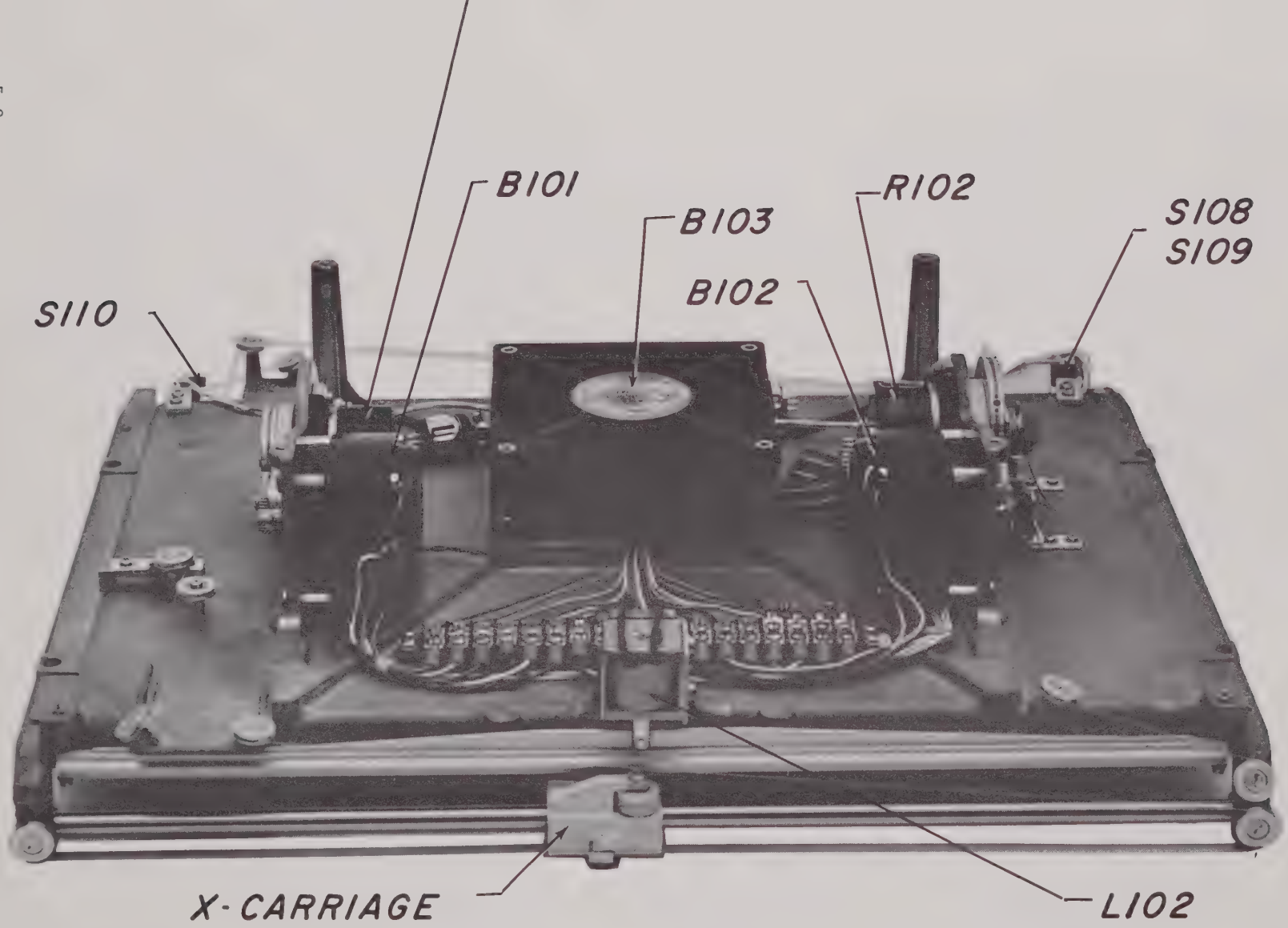


FIGURE 5-1 TRANSLATION ASSEMBLY

Schematic Reference	Description	Varian Part Number
F101 *	Fuse, 0.5 amp, 230V	67-135-350
F101 +	Fuse, 1 amp, 115V	67-135-410
L101	Choke, phasing	971-806
L102	Solenoid, dc, continuous duty, 48v	75-159-993
L103	Choke, phasing	971-806
R101	Resistor, variable, three-turn, 3k, ±10%	906-549
R102	Resistor, variable, three-turn, 3k, ±10%	906-549
R103	Resistor, fixed, composition, 270k, ±5%, 1/2w	32-201-627
R104	Resistor, fixed, film, 4k, ±1%, 1/4w	31-224-400
R105	See S101	
R106	Resistor, variable, 25k, ±20%, 1/4w	972-168-01
R107	Resistor, variable, wirewound, 1.5k, ±5%, 2w	37-586-415
R108	Resistor, variable, wirewound, 25k, ±5%, 2w	37-586-525
R109	Resistor, variable, 5k, ±3%, 3w	972-796
R110	Not Used	
R111	Not Used	
R112	Resistor, fixed, film, 5.5k, ±1%, 1/4w	31-224-550
R113	See S103	
R114	Resistor, variable, 5k, ±3%, 3w	972-796
R115	Not Used	
R116	Not Used	
R117	Resistor, variable, wirewound, 25k, ±5%, 2w	37-586-525
R118	Resistor, variable, wirewound, 2.5k, ±5%, 2w	37-586-425
R119	Resistor, variable, 25k, ±20%, 1/4w	972-168-01
R120 +	Resistor, fixed, film, 10k, ±0.1%, 1/4w	31-613-205
R120 *	Resistor, fixed, film, 15k, ±0.1%, 1/4w	31-613-213
R121 +	Resistor, fixed, film, 200k, ±0.1%, 1/4w	31-613-206
R121 *	Resistor, fixed, film, 25k, ±0.1%, 1/4w	31-613-212
R122 +	Resistor, fixed, film, 60k, ±0.1%, 1/4w	31-613-207
R122 *	Resistor, fixed, film, 50k, ±0.1%, 1/4w	31-613-211
R123 +	Resistor, fixed, film, 100k, ±0.1%, 1/4w	31-613-208
R123 *	Resistor, fixed, film, 150k, ±0.1%, 1/4w	31-613-210
R124 +	Resistor, fixed, film, 200k, ±0.1%, 1/4w	31-613-209
R124 *	Resistor, fixed, film, 250k, ±0.1%, 1/4w	31-613-214
R125 +	Resistor, fixed, film, 600k, ±0.1%, 1/2w	31-614-800
R125 *	Resistor, fixed, film, 500k, ±0.1%, 1/2w	31-614-802
R126 +	Resistor, fixed, film, 1 meg, ±0.1%, 1/2w	31-614-801
R126 *	Resistor, fixed, film, 500k, ±0.1%, 1/2w	31-614-802
R127	Not Used	
R128	Resistor, fixed, film, 5k, ±0.1%, 1/4w	41-613-204

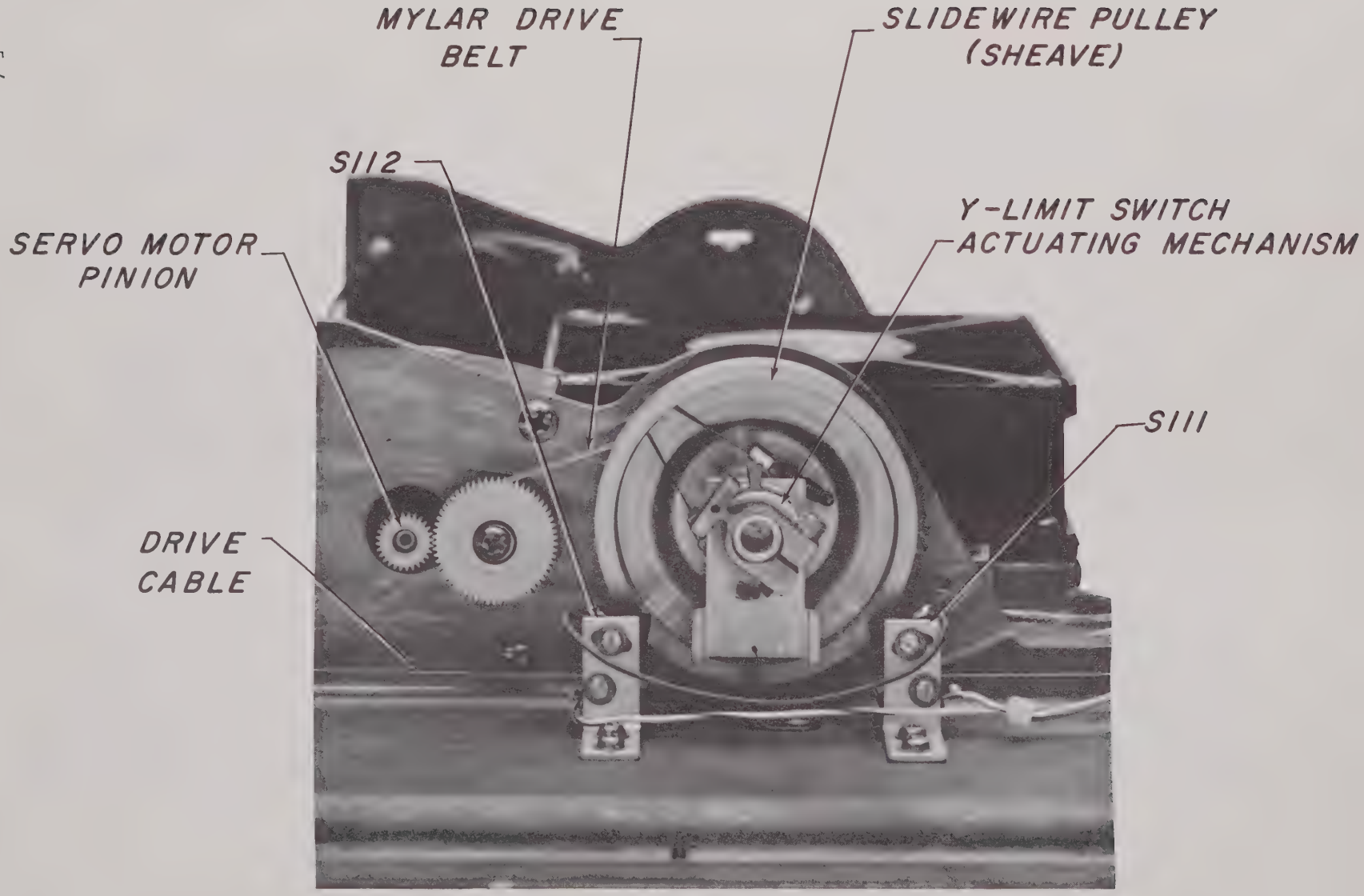


FIGURE 5-2 MECHANICAL DRIVE Y-AXIS

Schematic Reference	Description	Varian Part Number
R129 +	Resistor, fixed, film, .3k, ±0.1%, 1/4w	31-613-203
R129 *	Resistor, fixed, film, 2.5k, ±0.1%, 1/4w	31-613-215
R130 +	Resistor, fixed, film, 1k, ±0.1%, 1/4w	31-613-202
R130 *	Resistor, fixed, film, 1.5k, ±0.1%, 1/4w	31-613-216
R131 +	Resistor, fixed, film, 900 ohms, ±0.1%, 1/4w	31-613-201
R131 *	Resistor, fixed, film, 500 ohms, ±0.1%, 1/4w	31-613-217
R132 +	Resistor, fixed, film, 500 ohms, ±0.1%, 1/4w	31-613-200
R132 *	Resistor, fixed, film, 450 ohms, ±0.1%, 1/4w	31-613-218
R133 +	Resistor, fixed, wirewound, 30 ohms, ±0.1%, 1/4w	907-315-13
R133 *	Resistor, fixed, wirewound, 25 ohms, ±0.1%, 1/4w	907-315-25
R134 +	Resistor, fixed, wirewound, 20 ohms, ±0.1%, 1/4w	907-315-14
R134 *	Resistor, fixed, wirewound, 25 ohms, ±0.1%, 1/4w	907-315-25
R135 +	Resistor, fixed, film, 10k, ±0.1%, 1/4w	31-613-205
R135 *	Resistor, fixed, film, 15k, ±0.1%, 1/4w	31-613-213
R136 +	Resistor, fixed, film, 200k, ±0.1%, 1/4w	31-613-206
R136 *	Resistor, fixed, film, 25k, ±0.1%, 1/4w	31-613-212
R137 +	Resistor, fixed, film, 60k, ±0.1%, 1/4w	31-613-207
R137 *	Resistor, fixed, film, 50k, ±0.1%, 1/4w	31-613-211
R138 +	Resistor, fixed, film, 100k, ±0.1%, 1/4w	31-613-208
R138 *	Resistor, fixed, film, 150k, ±0.1%, 1/4w	31-613-210
R139 +	Resistor, fixed, film, 200k, ±0.1%, 1/4w	31-613-209
R139 *	Resistor, fixed, film, 250k, ±0.1%, 1/4w	31-613-214
R140 +	Resistor, fixed, film, 600k, ±0.1%, 1/2w	31-614-800
R140 *	Resistor, fixed, film, 500k, ±0.1%, 1/2w	31-614-802
R141 +	Resistor, fixed, film, 1 meg, ±0.1%, 1/2w	31-614-801
R141 *	Resistor, fixed, film, 500k, ±0.1%, 1/2w	31-614-802
R142	Not Used	
R143	Resistor, fixed, film, 5k, ±0.1%, 1/4w	31-613-204
R144 +	Resistor, fixed, film, 3k, ±0.1%, 1/4w	31-613-203
R144 *	Resistor, fixed, film, 2.5k, ±0.1%, 1/4w	31-613-215
R145 +	Resistor, fixed, film, 1k, ±0.1%, 1/4w	31-613-202
R145 *	Resistor, fixed, film, 1.5k, ±0.1%, 1/4w	31-613-216
R146 +	Resistor, fixed, film, 900 ohms, ±0.1%, 1/4w	31-613-201
R146 *	Resistor, fixed, film, 500 ohms, ±0.1%, 1/4w	31-613-217
R147 +	Resistor, fixed, film, 500 ohms, ±0.1%, 1/4w	31-613-200
R147 *	Resistor, fixed, film, 450 ohms, ±0.1%, 1/4w	31-613-218

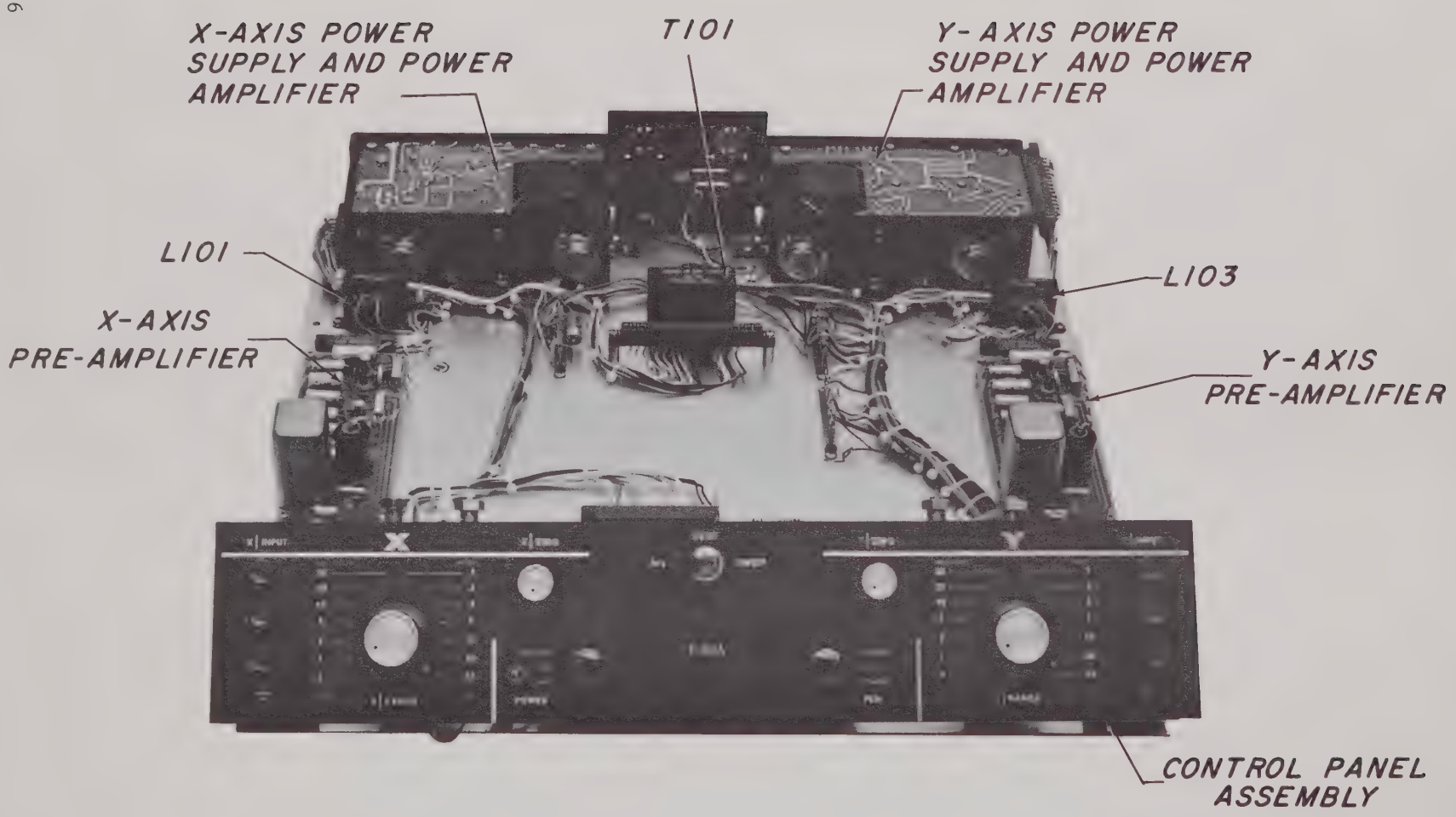


FIGURE 5-3 BOTTOM PLATE ASSEMBLY

Schematic Reference	Description	Varian Part Number
R148 +	Resistor, fixed, wirewound, 30 ohms, ±0.1%, 1/4w	907-315-13
R148 *	Resistor, fixed, wirewound, 25 ohms, ±0.1%, 1/4w	907-315-25
R149 +	Resistor, fixed, wirewound, 20 ohms, ±0.1%, 1/4w	907-315-14
R149 *	Resistor, fixed, wirewound, 25 ohms, ±0.1%, 1/4w	907-315-25
R150	Resistor, fixed, composition, 120k, ±5%, 1/2w	32-201-612
S101, R105, S104	Switch assembly, three-pole fourteen-position wafer switch, and 500k variable resistor with single-pole single-throw switch	906-747
S102	Switch, function	971-807
S103, R113, S105	Switch assembly, three-pole fourteen-position wafer switch, and 500k variable resistor with single-pole single-throw switch	906-747
S104	See S101	
S105	See S103	
S106	Switch, telephone type, three-position, two form C contacts	907-314
S107	Switch, telephone type, three-position, two form C contacts	907-314
S108	Switch, sensitive, SPDT	71-428-960
S109	Switch, sensitive, SPDT	71-428-960
S110	Switch, sensitive, SPDT	71-428-960
S111	Switch, sensitive, SPDT	71-428-960
S112	Switch, sensitive, SPDT	71-428-960
T101	Transformer, power	907-200
C201	Capacitor, fixed, mylar, 0.03 mfd, ±20%, 200 vdcw	907-529-14
C202	Capacitor, fixed, electrolytic, 5 mfd, 50 vdcw	41-506-247
C203	Capacitor, fixed, plastic, 0.01 mfd, 200 vdcw	41-724-957
C204	Capacitor, fixed, electrolytic, 150 mfd, 3 vdcw	41-506-227
C205	Capacitor, fixed, electrolytic, 25 mfd, 25 vdcw	41-506-255
C206	Capacitor, fixed, electrolytic, 25 mfd, 25 vdcw	41-506-255

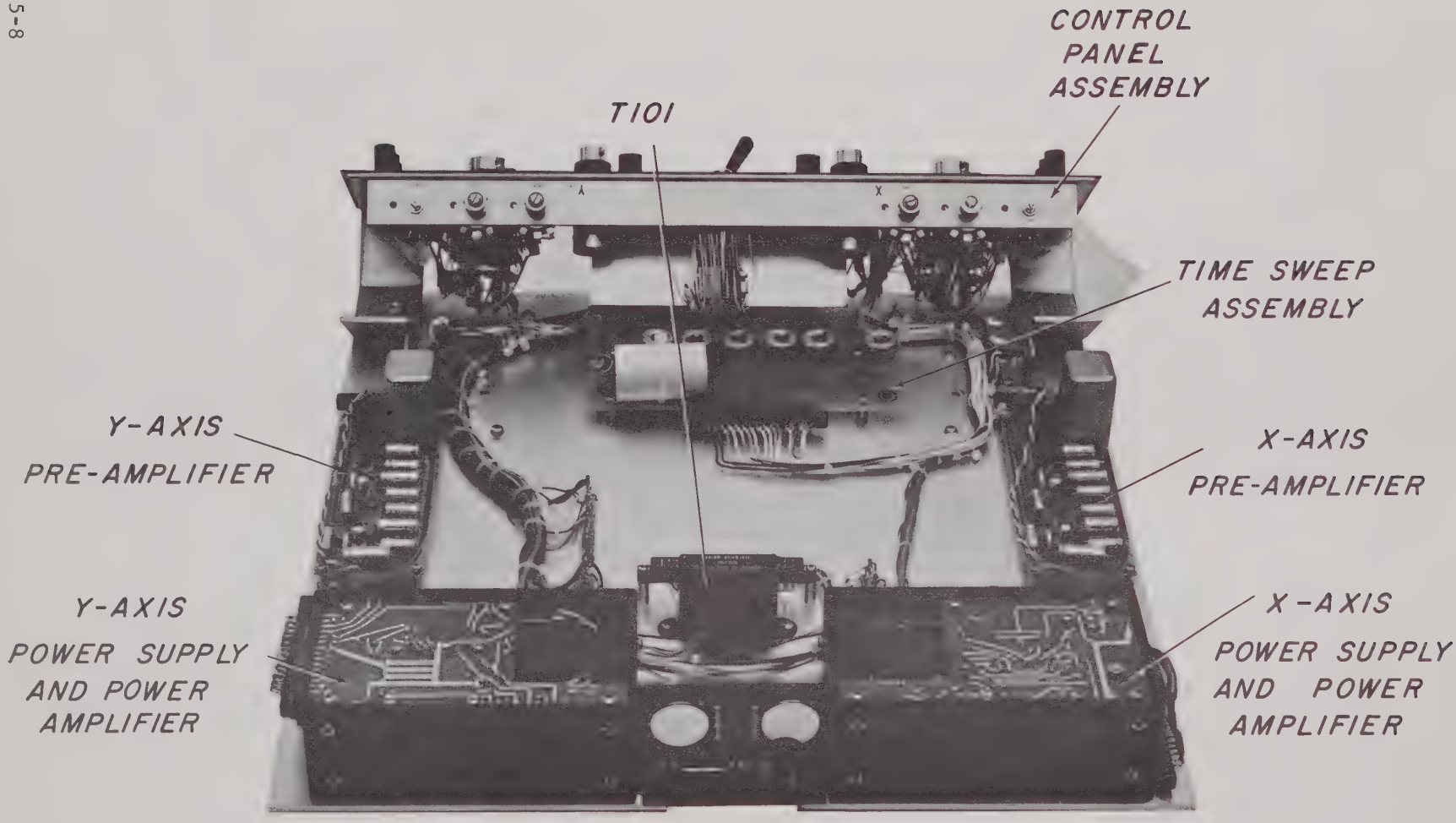


FIGURE 5-4 BOTTOM PLATE ASSEMBLY

Schematic Reference	Description	Varian Part Number
C207	Capacitor, fixed, electrolytic, 100 mfd, 12 vdcw	41-506-253
C208	Capacitor, fixed, electrolytic, 25 mfd, 12 vdcw	41-506-219
C209	Capacitor, fixed, electrolytic, 150 mfd, 3 vdcw	41-506-227
C210	Capacitor, fixed, plastic, 0.0033 mfd, 200 vdcw	41-724-953
C211	Capacitor, fixed, electrolytic, 25 mfd, 12 vdcw	41-506-219
C212	Capacitor, fixed, electrolytic, 25 mfd, 12 vdcw	41-506-219
C213	Capacitor, fixed, electrolytic, 150 mfd, 12 vdcw	41-506-254
CH201	Chopper, 7-pin miniature, 6.3v ac	905-523
CR201	Diode, 1N457A	66-300-457
CR202	Diode, 1N457A	66-300-457
CR203	Diode, 1N457A	66-300-457
CR204	Diode, 1N457A	66-300-457
Q201	Transistor, 2N3391	62-003-391
Q202	Transistor, 2N2613	62-902-613
Q203	Transistor, 2N3391	62-003-391
Q204	Transistor, 2N2613	62-902-613
R201	Resistor, fixed, composition, 150k, ±5%, 1/4w	32-301-615
R202	Resistor, fixed, film, 3.01k, ±1%, 1/4w	31-224-301
R203	Resistor, fixed, film, 1 meg, ±1%, 1w	31-467-100
R204	Resistor, fixed, composition, 27k, ±5%, 1/4w	32-301-527
R205	Resistor, fixed, composition, 33k, ±5%, 1/4w	32-301-533
R206	Resistor, fixed, composition, 330k, ±5%, 1/4w	32-301-633
R207	Resistor, fixed, composition, 270 ohms, ±5%, 1/4w	32-301-327
R208	Resistor, fixed, composition, 390k, ±5%, 1/4w	32-301-639
R209	Resistor, fixed, composition, 8.2k, ±5%, 1/4w	32-301-482
R210	Resistor, fixed, composition, 180 ohms, ±5%, 1/4w	32-301-318

Schematic Reference	Description	Varian Part Number
R211	Resistor, fixed, composition, 12k, ±5%, 1/4w	32-301-512
R212	Resistor, fixed, composition, 18k, ±5%, 1/4w	32-301-518
R213	Resistor, fixed, composition, 470 ohms, ±5%, 1/4w	32-301-347
R214	Resistor, fixed, composition, 22k, ±5%, 1/4w	32-301-522
R215	Resistor, fixed, composition, 150k, ±5%, 1/4w	32-301-615
R216	Resistor, fixed, composition, 18k, ±5%, 1/4w	32-301-518
R217	Resistor, fixed, composition, 220 ohms, ±5%, 1/4w	32-301-322
R218	Resistor, fixed, composition, 18k, ±5%, 1/4w	32-301-518
R219	Resistor, fixed, composition, 27k, ±5%, 1/4w	32-301-527
R220	Resistor, fixed, composition, 2.2k, ±5%, 1/4w	32-301-422
T201	Transformer	907-753
BR301	Bridge, full-wave rectifying	908-047-01
BR302	Bridge, full-wave rectifying	908-047-01
BR303	Rectifier, silicon bridge	66-230-700
C301	Capacitor, fixed, electrolytic, 500 mfd, 50 vdcw	41-508-881
C302	Capacitor, fixed, electrolytic, 50 mfd, 50 vdcw	41-506-259
C303	Capacitor, fixed, electrolytic, 50 mfd, 50 vdcw	41-506-259
C304	Capacitor, fixed, electrolytic, 50 mfd, 50 vdcw	41-506-259
C305	Capacitor, fixed, electrolytic, 50 mfd, 25 vdcw	41-506-256
C306	Capacitor, fixed, electrolytic, 50 mfd, 25 vdcw	41-506-256
C307	Capacitor, fixed, electrolytic, 25 mfd, 25 vdcw	41-506-255
C308	Capacitor, fixed, electrolytic, 25 mfd, 25 vdcw	41-506-255
C309	Capacitor, fixed, electrolytic, 25 mfd, 12 vdcw	41-506-219
C310	Capacitor, fixed, electrolytic, 25 mfd, 12 vdcw	41-506-219

Schematic Reference	Description	Varian Part Number
C311	Capacitor, fixed, plastic, 0.33 mfd, 200 vdcw	41-724-969
C312	Capacitor, fixed, plastic, 0.33 mfd, 200 vdcw	41-724-969
C313	Capacitor, fixed, plastic, 0.0022 mfd, 200 vdcw	41-724-952
C314	Capacitor, fixed, electrolytic, 200 mfd, 10 vdcw	41-506-225
C315	Capacitor, fixed, plastic, 0.033 mfd, 200 vdcw	41-724-972
C316	Capacitor, fixed, plastic, 0.033 mfd, 200 vdcw	41-724-972
CR301	Diode, LMZX-22A	66-393-402
CR302	Diode, LMZX-22A	66-393-402
CR303	Diode, LMZX-22A	66-393-402
CR304	Diode, 1N936	66-300-936
Q301	Transistor, RCA 40319	62-989-600
Q302	Transistor, 2N3053/40053	62-003-053
Q303	Transistor, 2N3391	62-003-391
Q304	Transistor, 2N3638	62-903-638
Q305	Transistor, 2N3391	62-003-391
Q306	Transistor, 2N3391	62-003-391
Q307	Transistor, 2N3391	62-003-391
Q308	Transistor, 2N3391	62-003-391
Q309	Transistor, 2N3053/40053	62-003-053
Q310	Transistor, 2N3053/40053	62-003-053
Q311	Transistor, power	971-579
Q312	Transistor, power	971-579
R301	Resistor, fixed, composition, 560 ohms, ±5%, 1w	33-301-356
R302	Resistor, fixed, composition, 1.5k, ±5%, 1/2w	32-201-415
R303	Resistor, fixed, composition, 1.5k, ±5%, 1/2w	32-201-415
R304	Resistor, fixed, composition, 1.5k, ±5%, 1/2w	32-201-415
R305	Resistor, fixed, composition, 220 ohms, ±5%, 1/4w	32-301-322
R306	Resistor, fixed, composition, 2.2k, ±5%, 1/4w	32-301-422
R307	Resistor, fixed, composition, 2.2k, ±5%, 1/4w	32-301-422
R308	Resistor, fixed, composition, 220 ohms, ±5%, 1/4w	32-301-322

Schematic Reference	Description	Varian Part Number
R309	Resistor, fixed, composition, 1.2k, ±5%, 1/4w	32-301-412
R310	Resistor, fixed, composition, 1.2k, ±5%, 1/4w	32-301-412
R311	Resistor, fixed, composition, 33k, ±5%, 1/4w	32-301-533
R312	Not Used	
R313	Resistor, fixed, composition, 10k, ±5%, 1/4w	32-301-510
R314	Resistor, fixed, composition, 1k, ±5%, 1/4w	32-301-410
R315	Resistor, fixed, composition, 1k, ±5%, 1/4w	32-301-410
R316	Resistor, fixed, composition, 10k, ±5%, 1/4w	32-301-510
R317	Resistor, fixed, composition, 15k, ±5%, 1/4w	32-301-515
R318	Resistor, fixed, composition, 15k, ±5%, 1/4w	32-301-515
R319	Resistor, fixed, composition, 1.5k, ±5%, 1/4w	32-301-415
R320	Resistor, fixed, composition, 2.2k, ±5%, 1/4w	32-301-422
R321	Resistor, fixed, composition, 100 ohms, ±5%, 1/4w	32-301-310
R322	Resistor, fixed, composition, 100 ohms, ±5%, 1/4w	32-301-310
R323	Resistor, fixed, composition, 2.2k, ±5%, 1/4w	32-301-422
R324	Resistor, fixed, composition, 10k, ±5%, 1/4w	32-301-510
R325	Resistor, fixed, composition, 10k, ±5%, 1/4w	32-301-510
R326	Resistor, fixed, composition, 10k, ±5%, 1/4w	32-301-510
R327	Resistor, fixed, composition, 10k, ±5%, 1/4w	32-301-510
R328	Resistor, fixed, composition, 560 ohms, ±5%, 1w	33-301-356
R329	Resistor, fixed, composition, 100 ohms, ±5%, 1/4w	32-301-310
R330	Resistor, fixed, composition, 100 ohms, ±5%, 1/4w	32-301-310
R331	Resistor, fixed, composition, 1.2k, ±5%, 1/4w	32-301-412
R332	Resistor, fixed, composition, 47 ohms, ±5%, 1/2w	32-201-247

Schematic Reference	Description	Varian Part Number
R333	Resistor, fixed, composition, 47 ohms, ±5%, 1/2w	32-201-247
R334	Resistor, fixed, composition, 1.2k, ±5%, 1/4w	32-301-412
R335	Resistor, fixed, composition, 1k, ±5%, 1/4w	32-301-410
R336	Resistor, fixed, wirewound, 1 ohm, ±5%, 3w	35-185-110
R337	Resistor, fixed, wirewound, 1 ohm, ±5%, 3w	35-185-110
R338	Resistor, fixed, composition, 1k, ±5%, 1/4w	32-301-410
R339	Resistor, fixed, composition, 10k, ±5%, 1/4w	32-301-510
T301	Transformer, power	971-641
T302	Transformer, interstage	907-980
C401	Capacitor, fixed, mylar, 22 mfd, ±10%, 200 vdcw	907-513-01
CR401	Diode, 1N936	66-300-936
R401	Resistor, fixed, film, 1.9 megohms, ±1%, 1/8w	31-607-190
R402	Resistor, fixed, film, 1.9 megohms, ±1%, 1/8w	31-607-190
R403	Resistor, fixed, film, 806k, ±1%, 1/8w	31-606-806
R404	Resistor, fixed, film, 3 megohms, ±1%, 1/8w	31-607-300
R405	Resistor, fixed, film, 20k, ±1%, 1/8w	31-605-200
R406	Resistor, fixed, film, 740k, ±1%, 1/8w	31-606-740
R407	Resistor, fixed, film, 440k, ±1%, 1/8w	31-606-440
R408	Resistor, fixed, film, 140k, ±1%, 1/8w	31-606-140
R409	Resistor, fixed, film, 65k, ±1%, 1/8w	31-605-650
R410	Resistor, fixed, film, 20k, ±1%, 1/8w	31-605-200
R411	Not Used	
R412	Resistor, fixed, film, 5k, ±1%, 1/8w	31-604-500

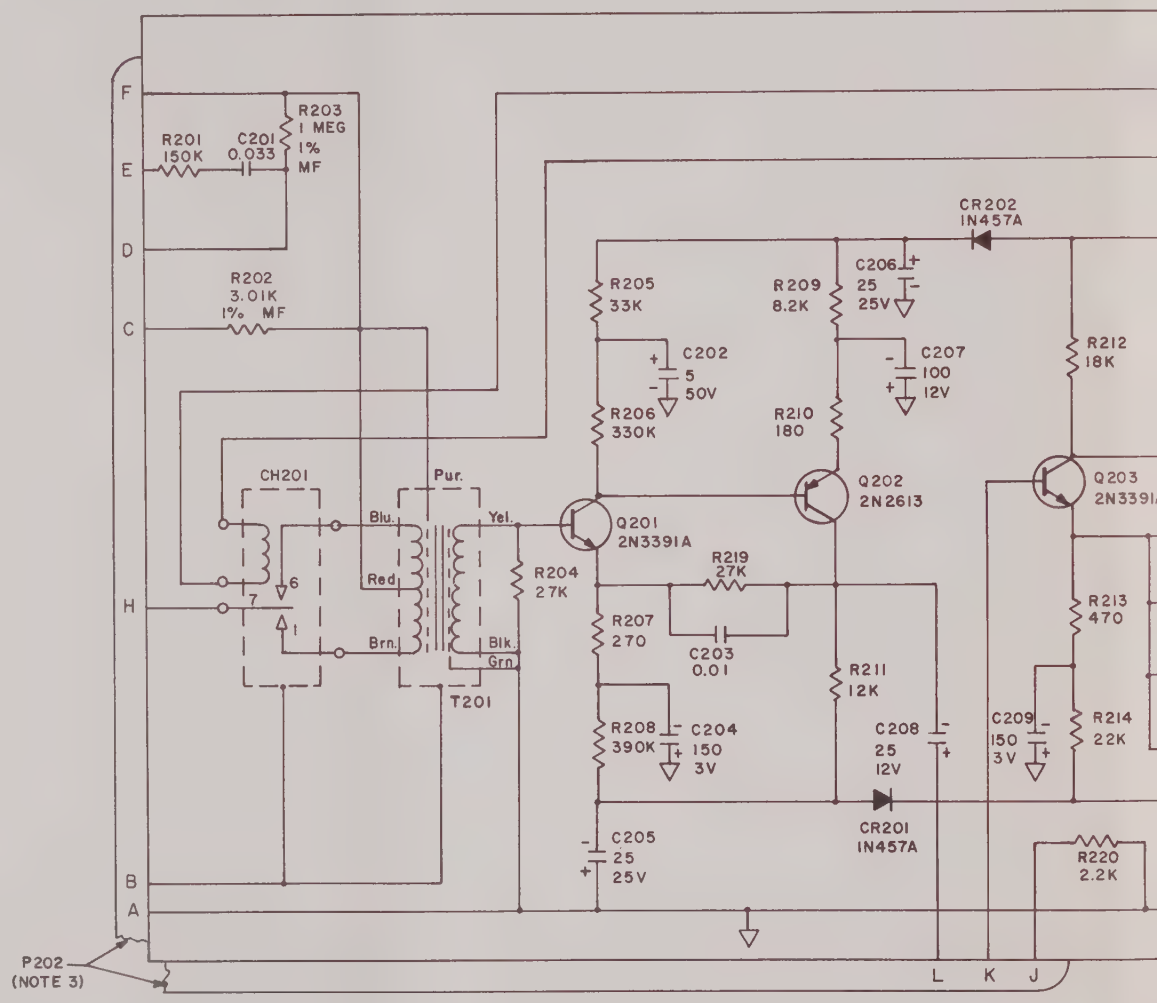
Schematic Reference	Description	Varian Part Number
R413 +	Resistor, fixed, film, 5k, ±1%, 1/8w	31-604-500
R413 *	Resistor, fixed, film, 3.32k, ±1%, 1/8w	31-604-332
R414	Resistor, variable, wirewound, 10k, ±20%, 2w	37-574-106
R415	Resistor, variable, wirewound, 10k, ±20%, 2w	37-574-106
R416	Resistor, variable, wirewound, 10k, ±20%, 2w	37-574-106
R417	Resistor, variable, wirewound, 10k, ±20%, 2w	37-574-106
R418	Resistor, variable, wirewound, 10k, ±20%, 2w	37-574-106
R419	Resistor, variable, wirewound, 10k, ±20%, 2w	37-574-106
R420	Resistor, variable, wirewound, 10k, ±5%	37-569-050
R421	Resistor, fixed, composition, 2.2k, ±5%, 1/2w	32-201-422

SECTION 6
SCHEMATIC DIAGRAMS

This section contains the following schematic diagrams:

Varian Drawing No.	Title
D972-036D	Schematic, Pre-Amplifier
E971-698D	Power Supply and Power Amplifier Schematic
C971-823F	Translation Wiring Diagram
E971-765J	Wiring Diagram, F-80A & F-80AM
E971-777G	Schematic, F-80A
E971-778H	Schematic, F-80AM
C972-035D	Schematic, Time Base
E972-011G	Wiring Diagram, F-81A & F-81AM
E972-038F	Schematic, F-81A
E972-041G	Schematic, F-81AM

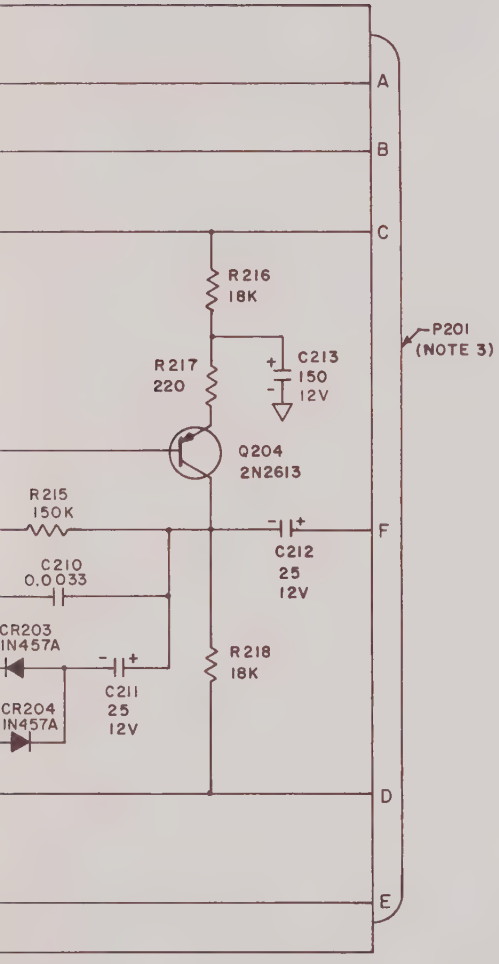
DASH NO.	TYPE OR MODEL	NEXT ASSEMBLY
	F-80A	D971748
	F-80AM	D971748
	F-81A	D971748
	F-81AM	D971748



SCHEMATI REF. DESIGNA
RESISTORS
CAPACITORS
DIODES
TRANSISTOR
CHOPPER
TRANSFORME

3. P201 AND P202 ARE PRINTED CIRCUIT BOARD CONNECTIONS.
2. ALL CAPACITOR VALUES ARE MICROFARADS, 200V UNLESS OTHERWISE SPECIFIED.
1. ALL RESISTORS ARE AS FOLLOWS UNLESS OTHERWISE SPECIFIED
   A. EXPRESSED IN OHMS
   B. 1/4 W
   C. 5% TOL.

NOTES:

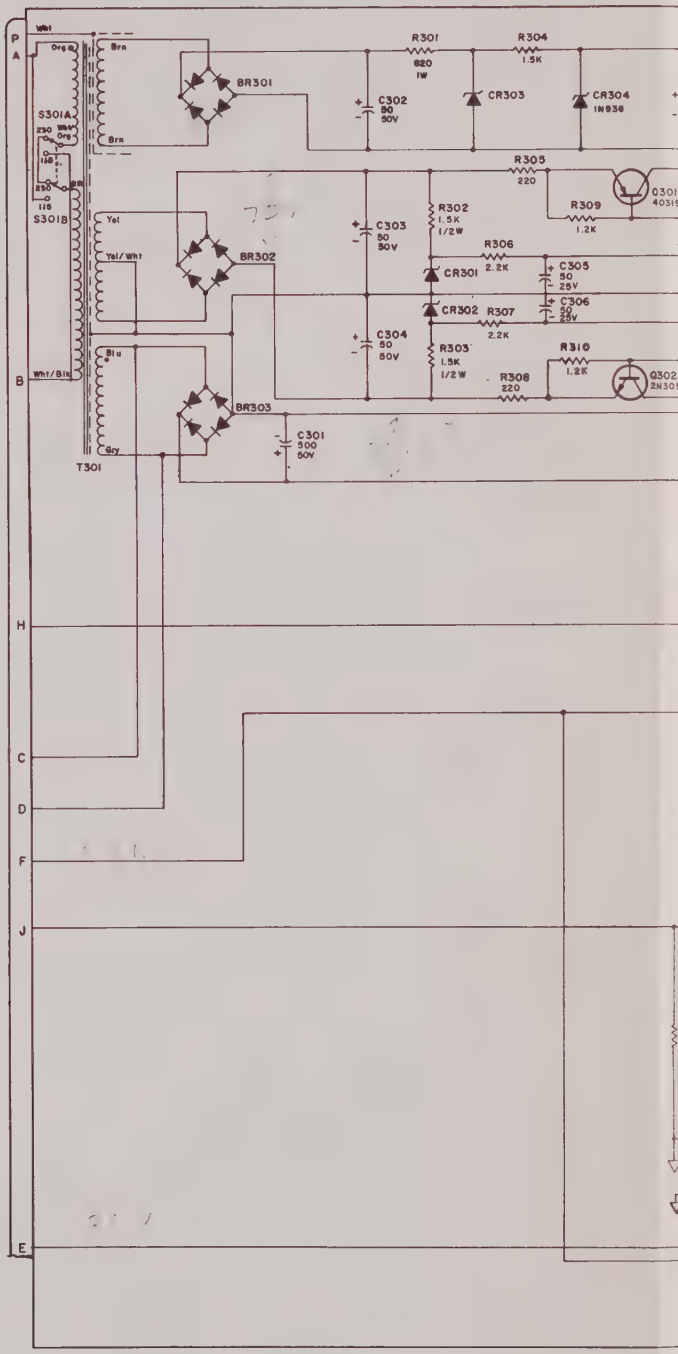


ON	LOWEST	HIGHEST
	R201	R220
	C201	C213
	CR201	CR204
	Q201	Q204
	CH201	CH201
	T201	T201

THIS DRAWING IS SCHEMATICALLY EQUIVALENT TO VARIAN DRAWING C972036D

SCHEMATIC - PRE-AMPLIFIER

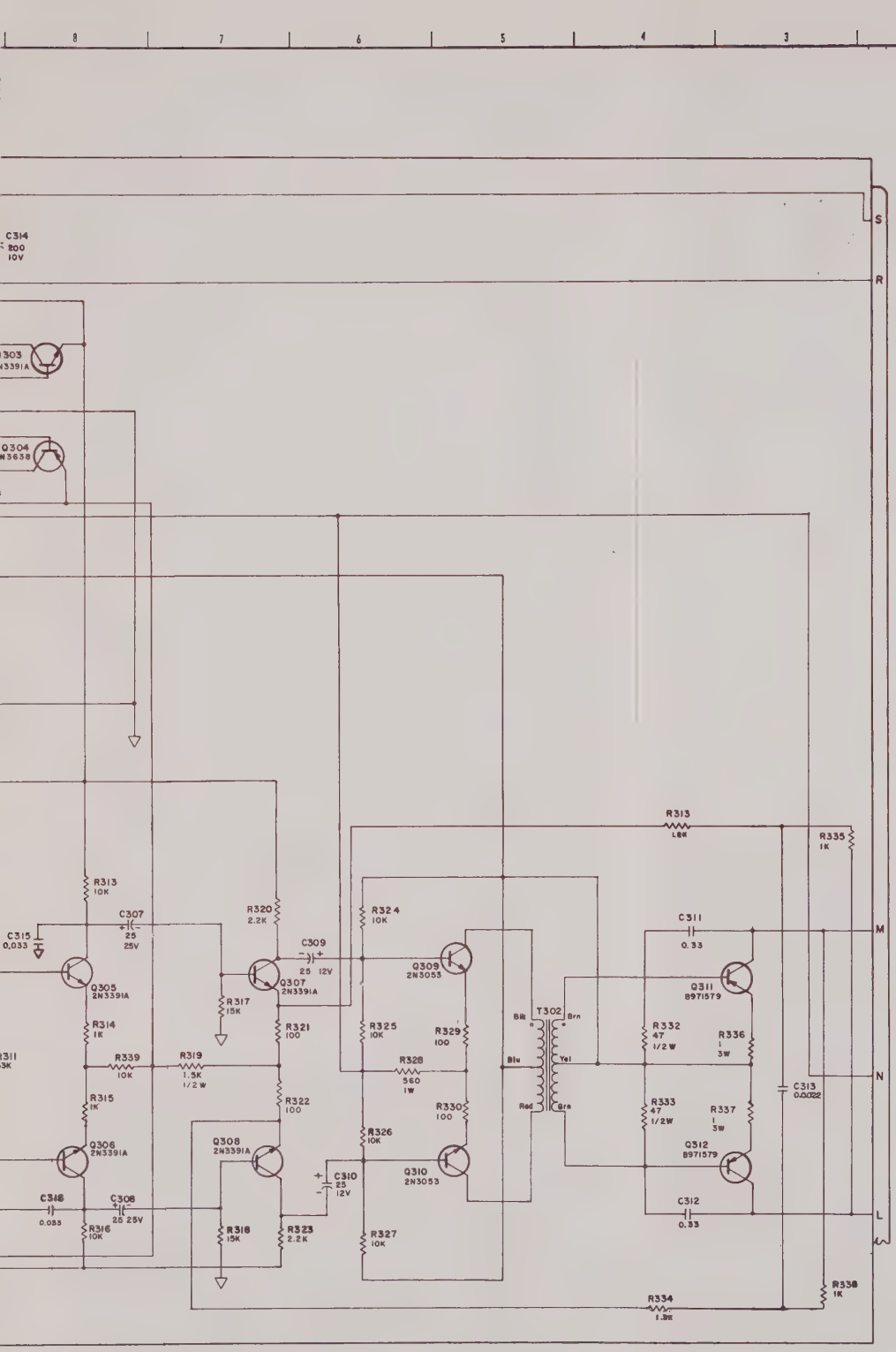
	TYPE OR MODEL	BEST ASSEMBLY
	F-80A	E971720
	F-80AM	E971720
	F-81A	E971720
	F-81AM	E971720



2. UNLESS OTHERWISE SPECIFIED CAPACITOR VALUES ARE IN MICROFARADS, 200 V.

1. UNLESS OTHERWISE SPECIFIED ALL RESISTORS ARE:
   A. EXPRESSED IN OHMS
   B. 1/4 W
   C. 5% TOL.

NOTES:

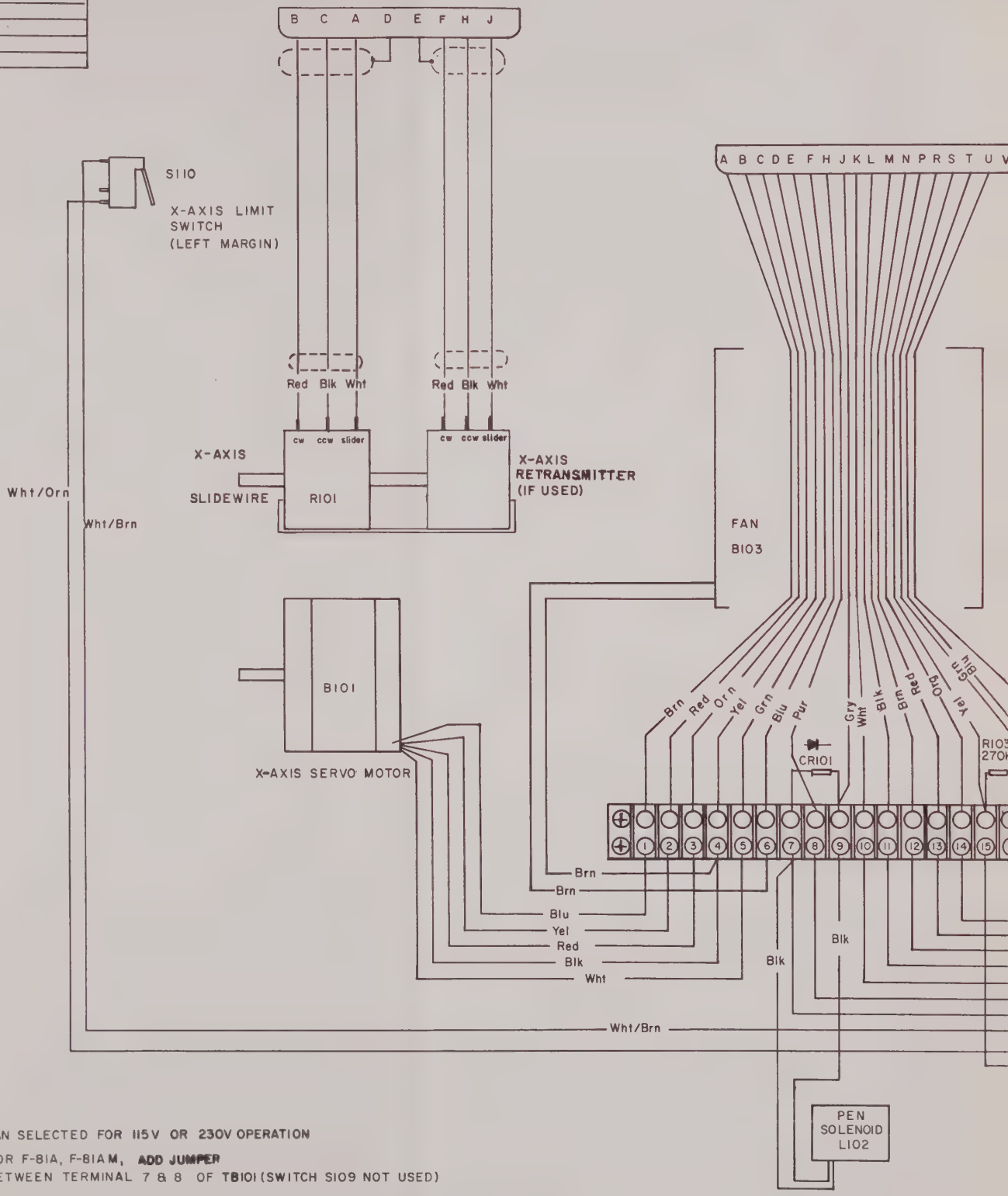


SCHEMATIC REF. DESIGNATION	LOWEST	HIGHEST
RESISTORS	R301	R339
CAPACITORS	C301	C316
TRANSISTORS	Q301	Q312
DIODES	CR301	CR304
BRIDGE DIODES	BR301	BR303
TRANSFORMER	T301	T302

THIS DRAWING IS SCHEMATICALLY EQUIVALENT TO VARIAN DRAWING E9716988.

POWER SUPPLY AND POWER AMPLIFIER SCHEMATIC

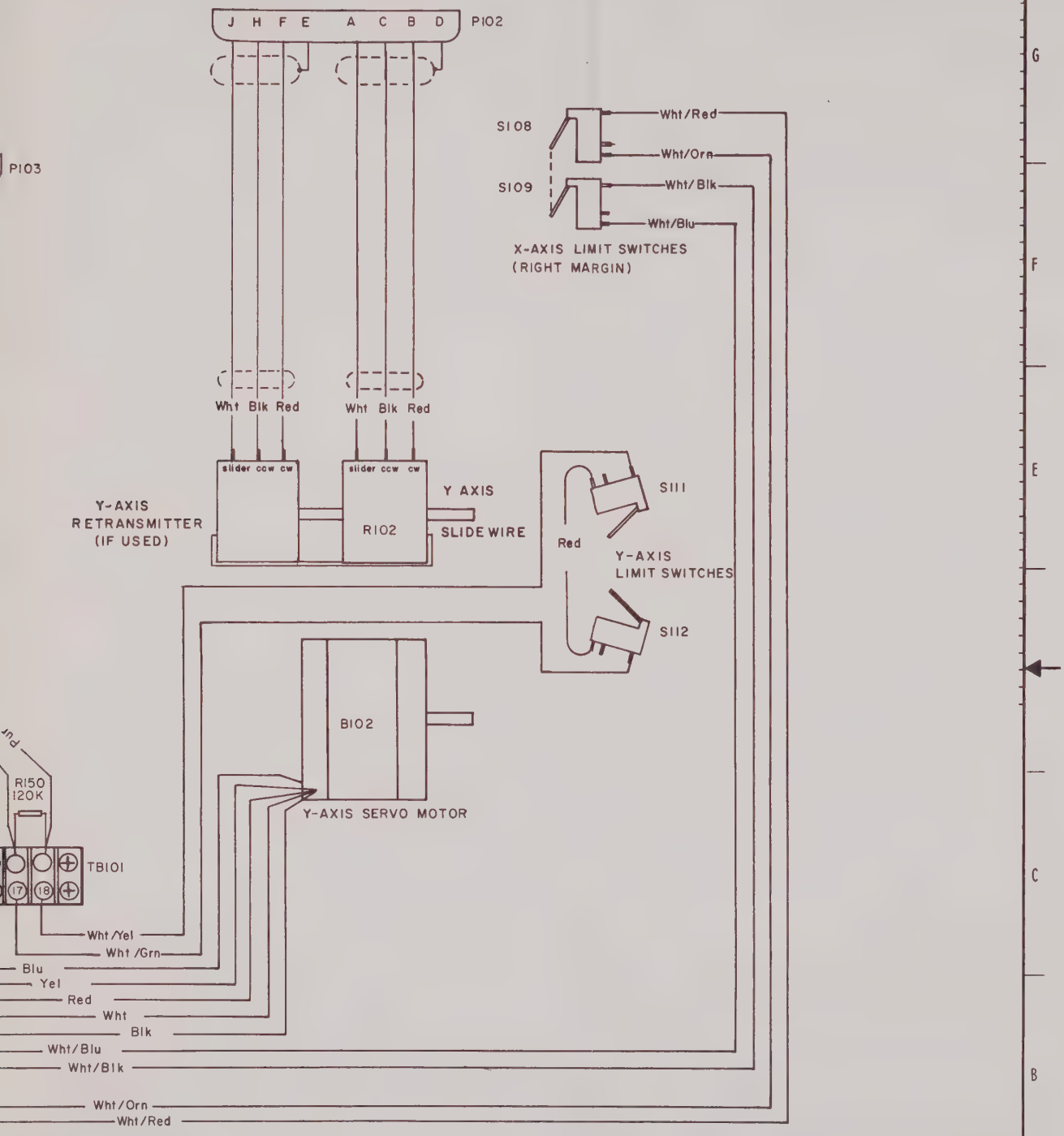
DASH NO.	TYPE OR MODEL	NEXT ASSEMBLY
	F-80A	
	F-80AM	
	F-81A	
	F-81AM	



NOTES:

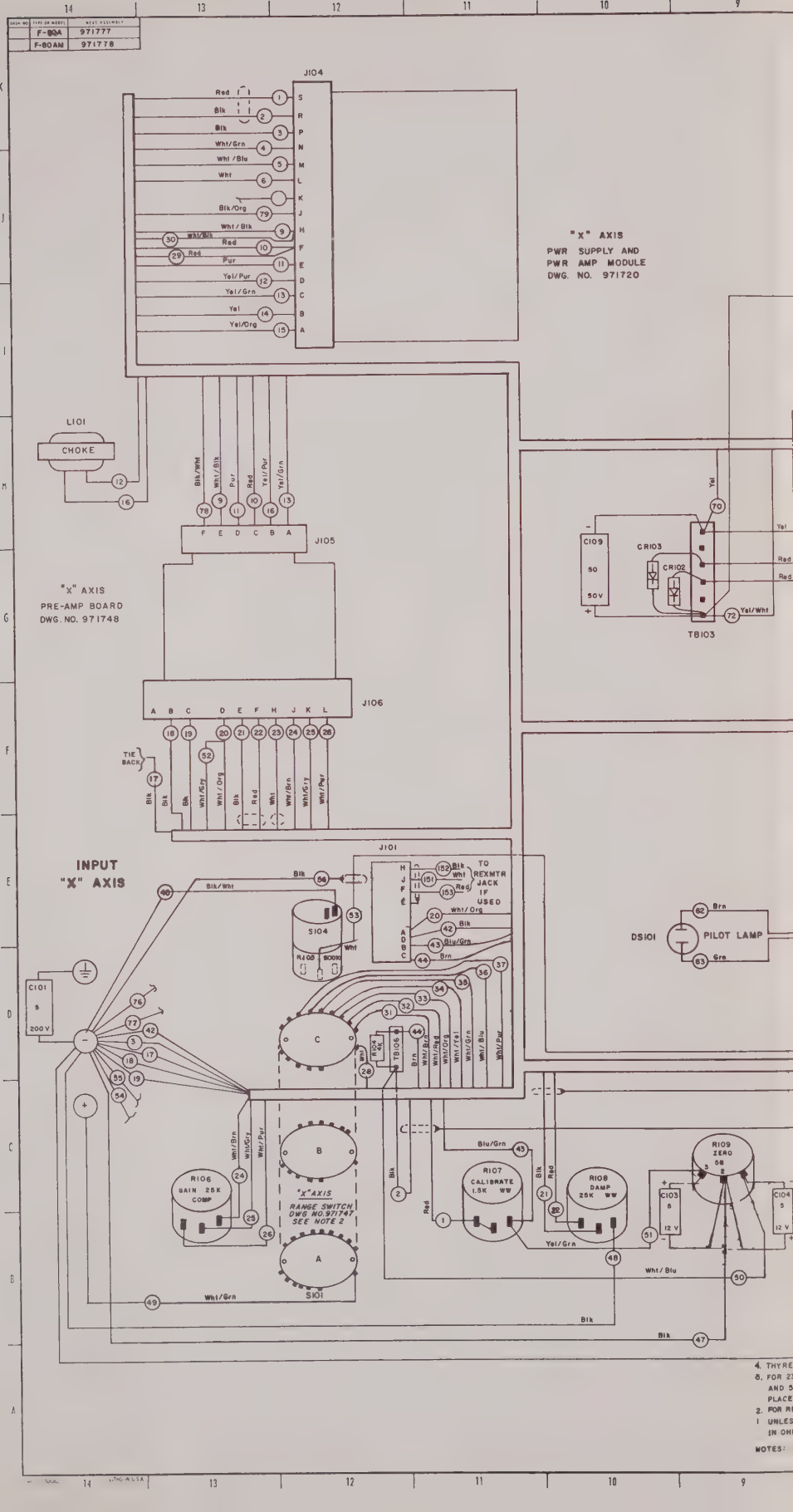
1. FAN SELECTED FOR 115V OR 230V OPERATION
2. FOR F-81A, F-81AM, **ADD JUMPER** BETWEEN TERMINAL 7 & 8 OF TB101 (SWITCH S109 NOT USED)

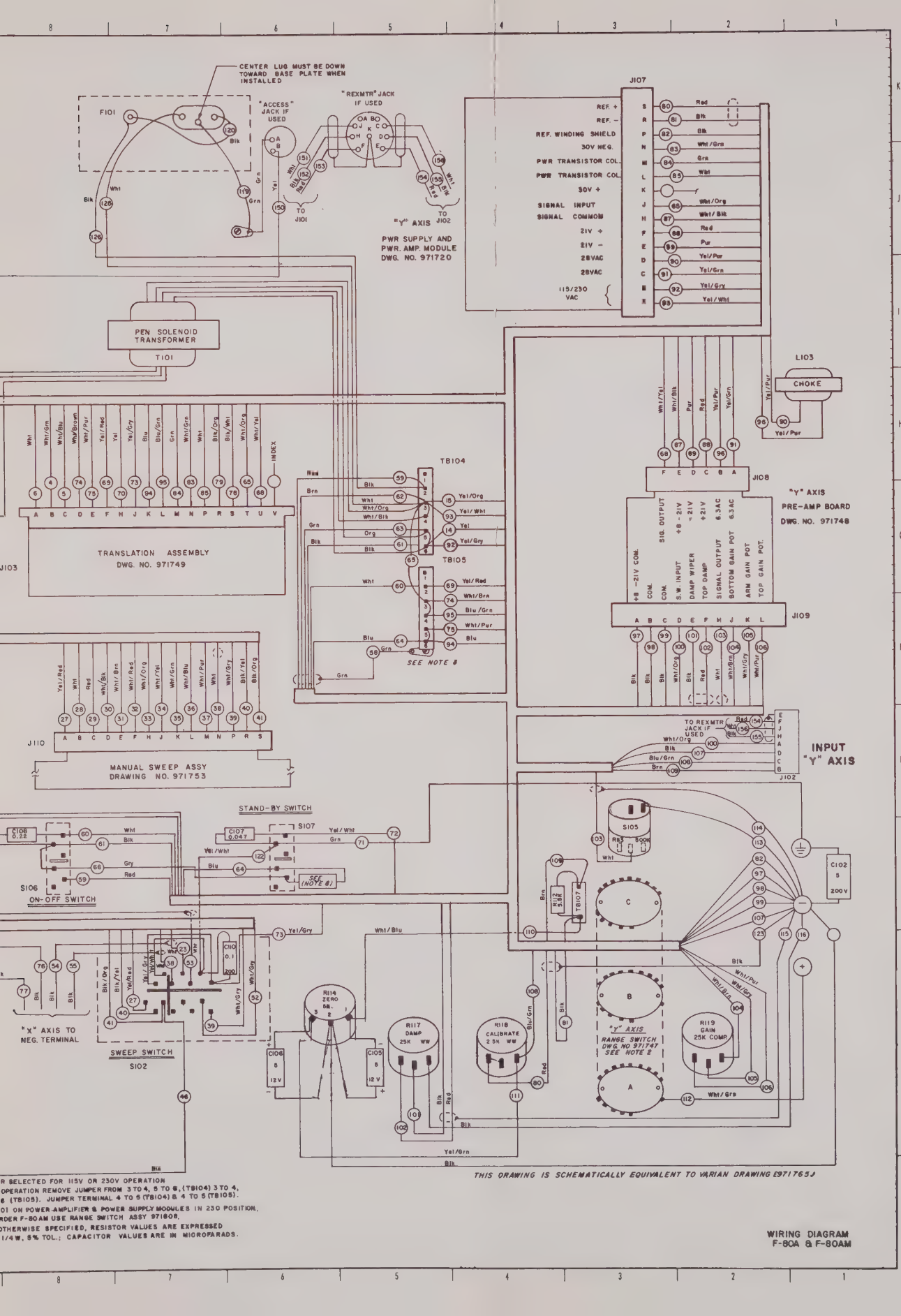
441-6-6 FEB66
LITHO IN U.S.A.

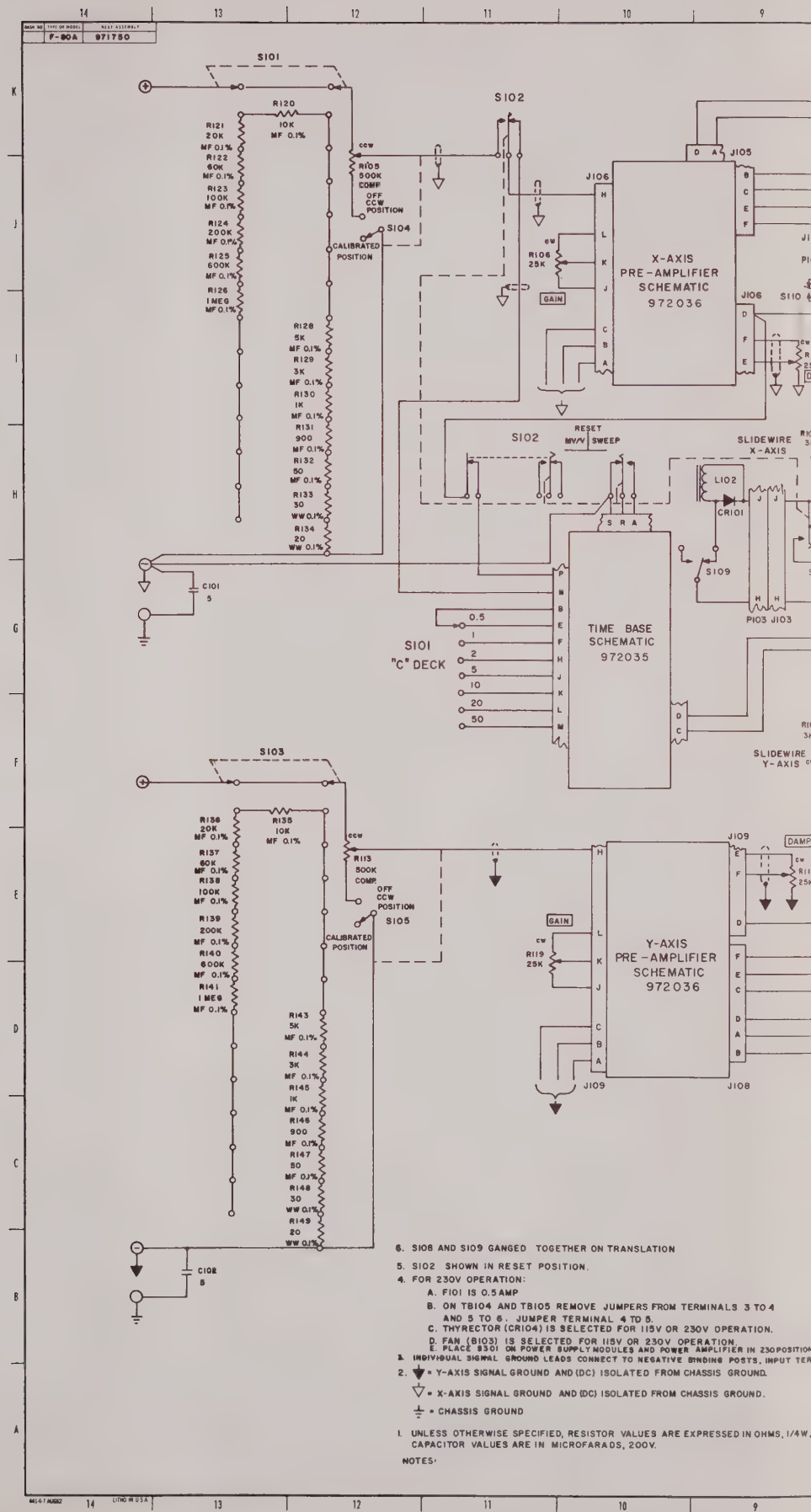


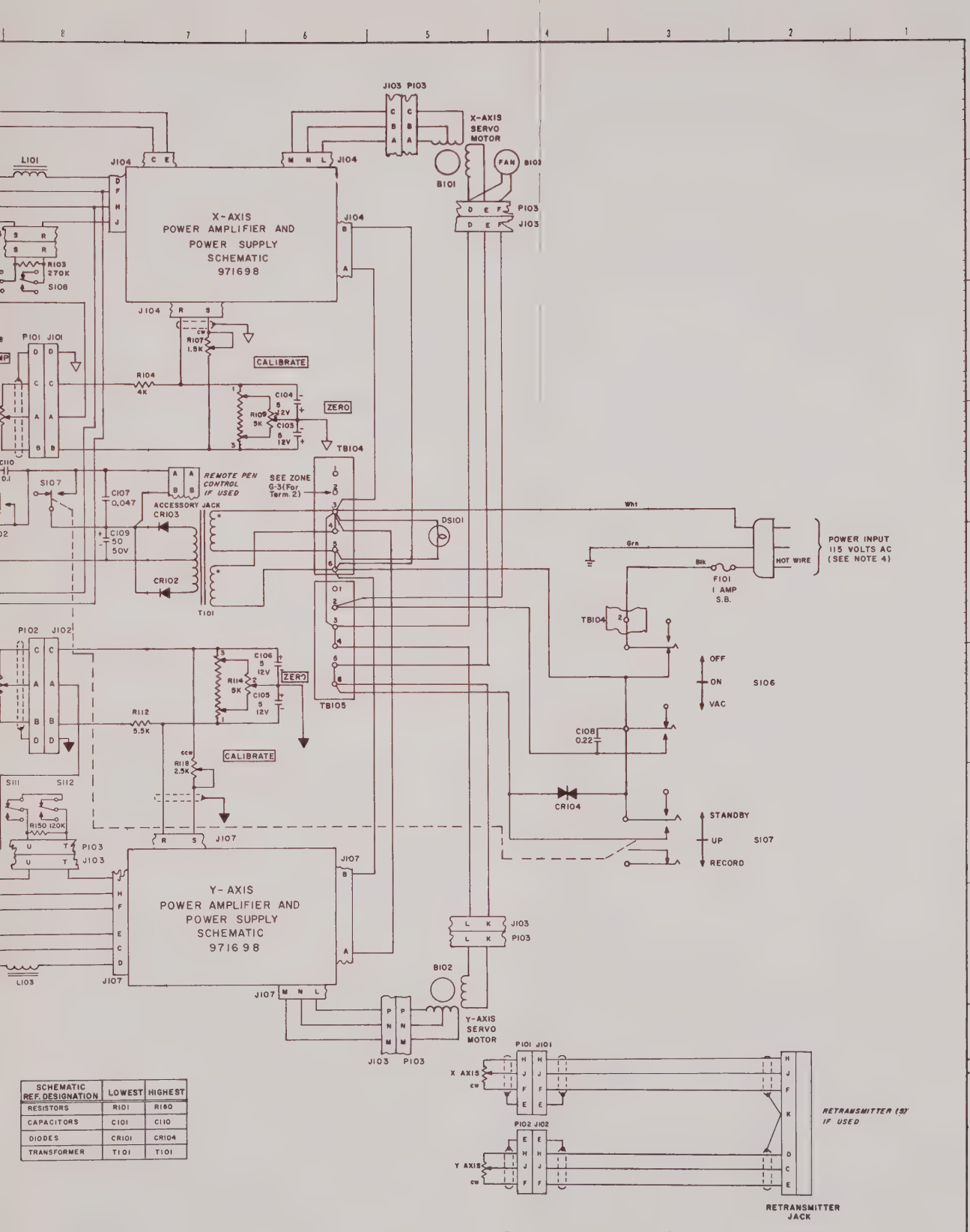
This drawing is equivalent to Varian drawing D971823 Rev. F.

TRANSLATION WIRING DIAGRAM


14 13 12 11 10 9
DASH NO. | TYPE OR MODEL | MFGT ASSEMBLY
F-80A | 971777
F-80AM | 971778
J104
Red
Blk
Blk
Wht/Grn
Wht/Blu
Wht
Blk/Org
Wht/Blk
Wht/Blk
Red
Red
Pur
Yel/Pur
Yel/Grn
Yel
Yel/Org
S R P N M L K J H F E D C B A
"X" AXIS
PWR SUPPLY AND
PWR AMP MODULE
DWG. NO. 971720
L101
CHOKE
J105
F E D C B A
"X" AXIS
PRE-AMP BOARD
DWG. NO. 971748
J106
A B C D E F H J K L
TIE BACK
J101
INPUT
"X" AXIS
S104
C101
5
200 V
C109
50
50 V
CR103
CR102
TB103
Yel/Wht
DS101
PILOT LAMP
TO REXMTR JACK IF USED
R106
GAIN 25K COMP
R107
CALIBRATE 1.5K WW
R108
DAMP 25K WW
R109
ZERO 5K
C103
5
12 V
C104
5
12 V
"X" AXIS
RANGE SWITCH
DWG NO 971747
SEE NOTE 2
S101
TB106
Blk/Wht
Wht/Blk
Pur
Red
Yel/Pur
Yel/Grn
Wht/Org
Wht/Yel
Wht/Blu
Wht/Pur
Wht/Brn
Wht/Gry
Blu/Grn
Yel/Grn
Wht/Blu
Wht/Grn
Blk
NOTES:
4. THYRE
5. FOR 2
AND 5
PLACE
2. FOR R
1 UNLES
IN OH
14 13 12 11 10 9


CENTER LUG MUST BE DOWN TOWARD BASE PLATE WHEN INSTALLED
F101
"ACCESS" JACK IF USED
"REXMTR" JACK IF USED
TO J101
"Y" AXIS
TO J102
PWR SUPPLY AND PWR. AMP. MODULE DWG. NO. 971720
J107
REF. +
REF. −
REF. WINDING SHIELD
30V NEG.
PWR TRANSISTOR COL.
PWR TRANSISTOR COL.
30V +
SIGNAL INPUT
SIGNAL COMMON
21V +
21V −
28VAC
28VAC
115/230 VAC
PEN SOLENOID TRANSFORMER
T101
L103
CHOKE
J108
"Y" AXIS PRE-AMP BOARD DWG. NO. 971748
J109
TRANSLATION ASSEMBLY DWG. NO. 971749
J103
TB104
TB105
SEE NOTE 8
J110
MANUAL SWEEP ASSY DRAWING NO. 971753
TO REXMTR JACK IF USED
J102
INPUT "Y" AXIS
STAND-BY SWITCH
S107
S106 ON-OFF SWITCH
SEE (NOTE 8)
S105
R112 5.6R
TB107
C102 5 200V
C106 0.22
C107 0.047
C110 0.1 200
"X" AXIS TO NEG. TERMINAL
SWEEP SWITCH S102
R114 ZERO SR.
R117 DAMP 25K WW
R118 CALIBRATE 2.5K WW
R119 GAIN 25K COMP.
"Y" AXIS RANGE SWITCH DWG. NO 971747 SEE NOTE 2
C106 5 12V
C105 5 12V
THIS DRAWING IS SCHEMATICALLY EQUIVALENT TO VARIAN DRAWING E971765J
R SELECTED FOR 115V OR 230V OPERATION
OPERATION REMOVE JUMPER FROM 3 TO 4, 5 TO 6, (TB104) 3 TO 4, 6 (TB105). JUMPER TERMINAL 4 TO 5 (TB104) & 4 TO 5 (TB105).
01 ON POWER AMPLIFIER & POWER SUPPLY MODULES IN 230 POSITION.
RDER F-80AM USE RANGE SWITCH ASSY 971808.
OTHERWISE SPECIFIED, RESISTOR VALUES ARE EXPRESSED 1/4W, 5% TOL.; CAPACITOR VALUES ARE IN MICROFARADS.
WIRING DIAGRAM F-80A & F-80AM


F-80A
971750
S101
S102
S103
S104
S105
R120
10K
MF 0.1%
R121
20K
MF 0.1%
R122
60K
MF 0.1%
R123
100K
MF 0.1%
R124
200K
MF 0.1%
R125
600K
MF 0.1%
R126
1 MEG
MF 0.1%
R128
5K
MF 0.1%
R129
3K
MF 0.1%
R130
1K
MF 0.1%
R131
900
MF 0.1%
R132
50
MF 0.1%
R133
30
WW 0.1%
R134
20
WW 0.1%
R105
500K
COMP
OFF
CCW
POSITION
CALIBRATED
POSITION
R106
25K
GAIN
CW
CCW
C101
5
J106
J105
X-AXIS
PRE-AMPLIFIER
SCHEMATIC
972036
J110
RESET
MV/V
SWEEP
SLIDEWIRE
X-AXIS
L102
CR101
S109
P103 J103
TIME BASE
SCHEMATIC
972035
S101
"C" DECK
0.5
1
2
5
10
20
50
SLIDEWIRE
Y-AXIS
R136
20K
MF 0.1%
R137
60K
MF 0.1%
R138
100K
MF 0.1%
R139
200K
MF 0.1%
R140
600K
MF 0.1%
R141
1 MEG
MF 0.1%
R135
10K
MF 0.1%
R113
500K
COMP
R143
5K
MF 0.1%
R144
3K
MF 0.1%
R145
1K
MF 0.1%
R146
900
MF 0.1%
R147
50
MF 0.1%
R148
30
WW 0.1%
R149
20
WW 0.1%
R119
25K
C102
5
J109
J108
Y-AXIS
PRE-AMPLIFIER
SCHEMATIC
972036
DAMP
6. S108 AND S109 GANGED TOGETHER ON TRANSLATION
5. S102 SHOWN IN RESET POSITION.
4. FOR 230V OPERATION:
A. F101 IS 0.5 AMP
B. ON TB104 AND TB105 REMOVE JUMPERS FROM TERMINALS 3 TO 4 AND 5 TO 6. JUMPER TERMINAL 4 TO 5.
C. THYRECTOR (CR104) IS SELECTED FOR 115V OR 230V OPERATION.
D. FAN (B103) IS SELECTED FOR 115V OR 230V OPERATION.
E. PLACE S301 ON POWER SUPPLY MODULES AND POWER AMPLIFIER IN 230 POSITION
3. INDIVIDUAL SIGNAL GROUND LEADS CONNECT TO NEGATIVE BINDING POSTS, INPUT TER
2. = Y-AXIS SIGNAL GROUND AND (DC) ISOLATED FROM CHASSIS GROUND.
= X-AXIS SIGNAL GROUND AND (DC) ISOLATED FROM CHASSIS GROUND.
= CHASSIS GROUND
1. UNLESS OTHERWISE SPECIFIED, RESISTOR VALUES ARE EXPRESSED IN OHMS, 1/4W.
CAPACITOR VALUES ARE IN MICROFARADS, 200V.
NOTES:

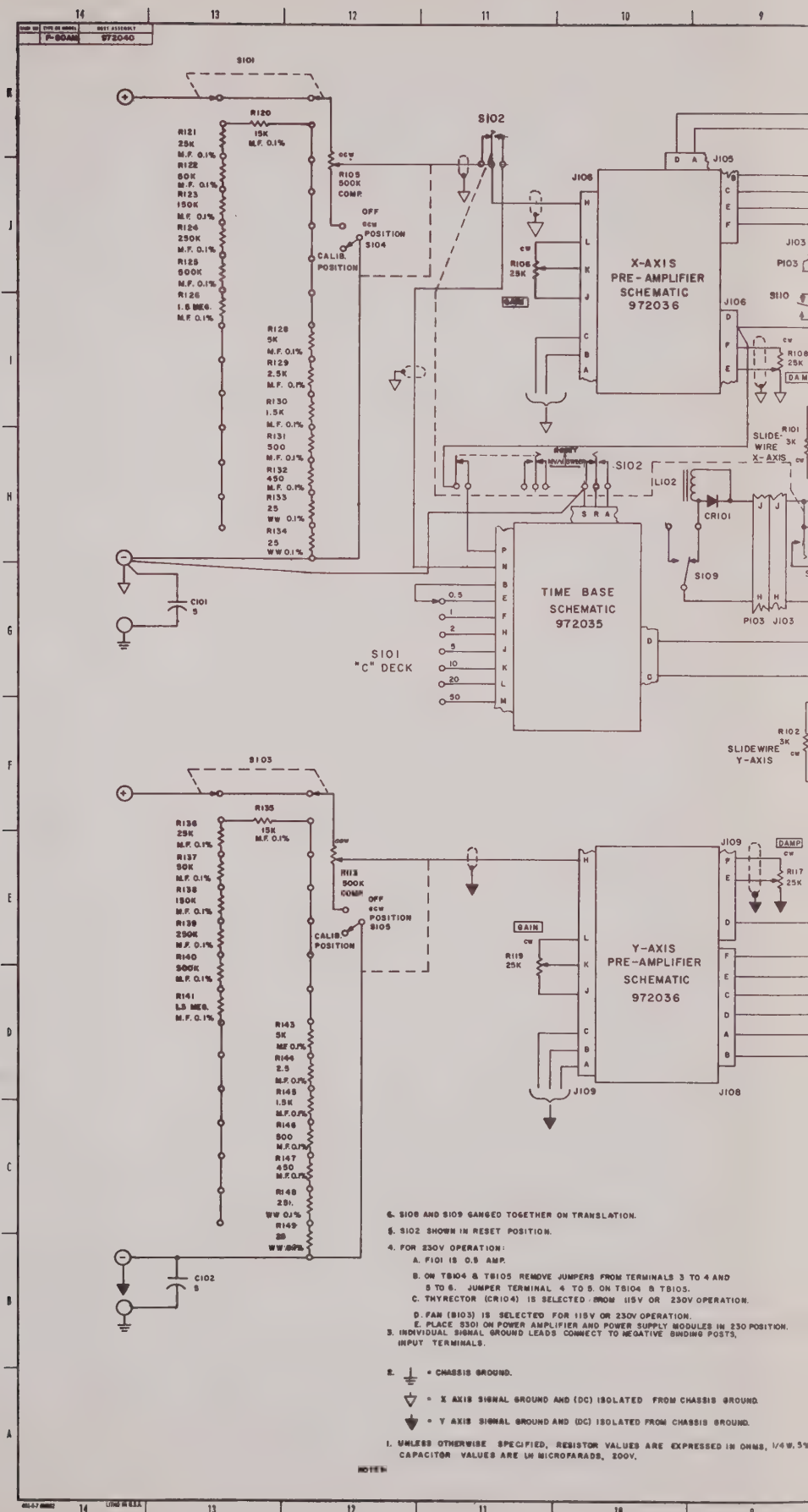


SCHEMATIC REF. DESIGNATION	LOWEST	HIGHEST
RESISTORS	R101	R150
CAPACITORS	C101	C110
DIODES	CR101	CR104
TRANSFORMER	T101	T101

INALS.

5% TOL.;

SCHEMATIC F-80A



6. S108 AND S109 GANGED TOGETHER ON TRANSLATION.

5. S102 SHOWN IN RESET POSITION.

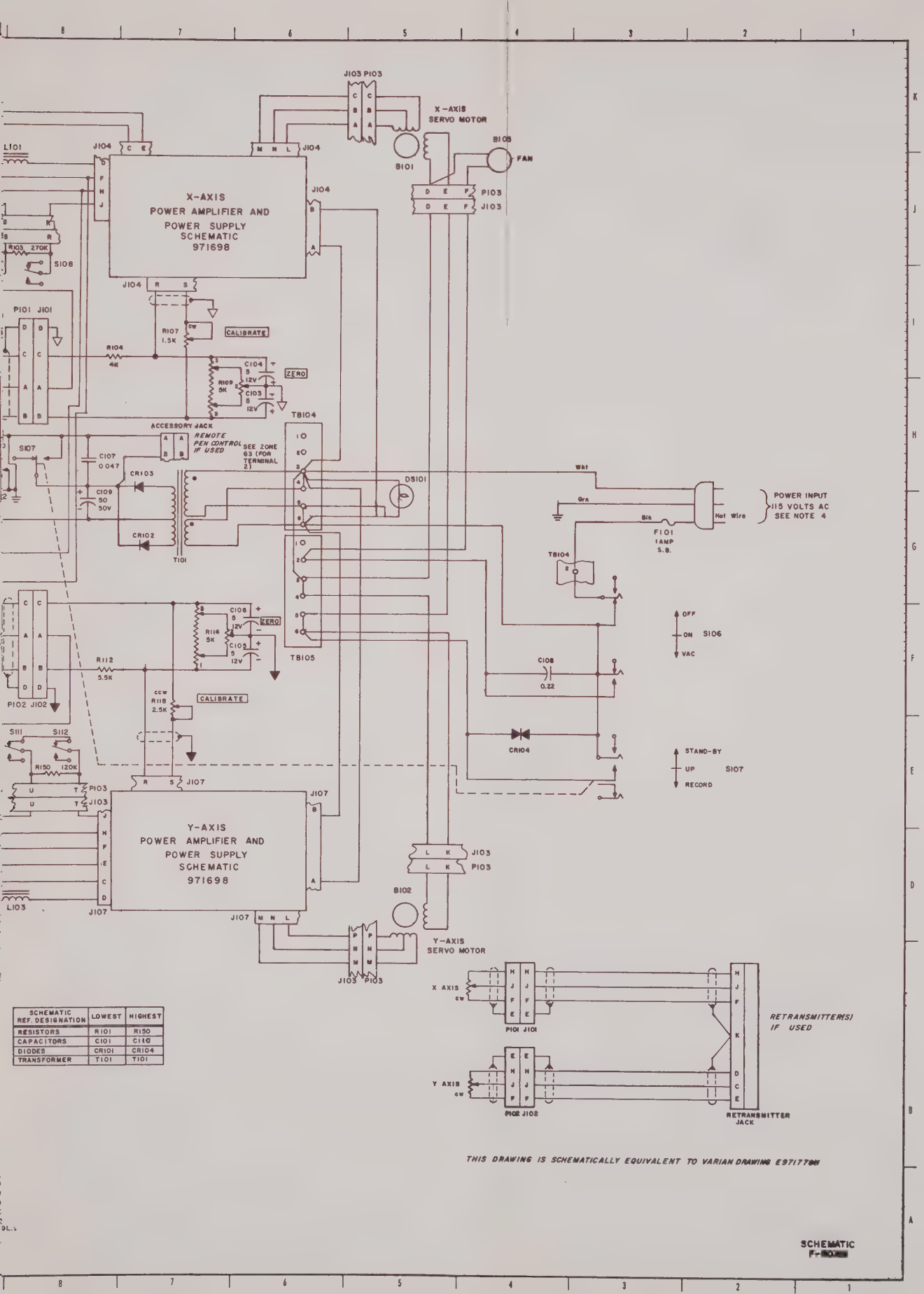
4. FOR 230V OPERATION:
   A. F101 IS 0.5 AMP.
   B. ON TB104 & TB105 REMOVE JUMPERS FROM TERMINALS 3 TO 4 AND 5 TO 6. JUMPER TERMINAL 4 TO 5. ON TB104 & TB105.
   C. THYRECTOR (CR104) IS SELECTED FROM 115V OR 230V OPERATION.
   D. FAN (B103) IS SELECTED FOR 115V OR 230V OPERATION.
   E. PLACE S301 ON POWER AMPLIFIER AND POWER SUPPLY MODULES IN 230 POSITION.

3. INDIVIDUAL SIGNAL GROUND LEADS CONNECT TO NEGATIVE BINDING POSTS, INPUT TERMINALS.

2. ⏚ = CHASSIS GROUND.
   ▽ = X AXIS SIGNAL GROUND AND (DC) ISOLATED FROM CHASSIS GROUND.
   ▼ = Y AXIS SIGNAL GROUND AND (DC) ISOLATED FROM CHASSIS GROUND.

1. UNLESS OTHERWISE SPECIFIED, RESISTOR VALUES ARE EXPRESSED IN OHMS, 1/4 W. 5% CAPACITOR VALUES ARE IN MICROFARADS, 200V.

NOTES:

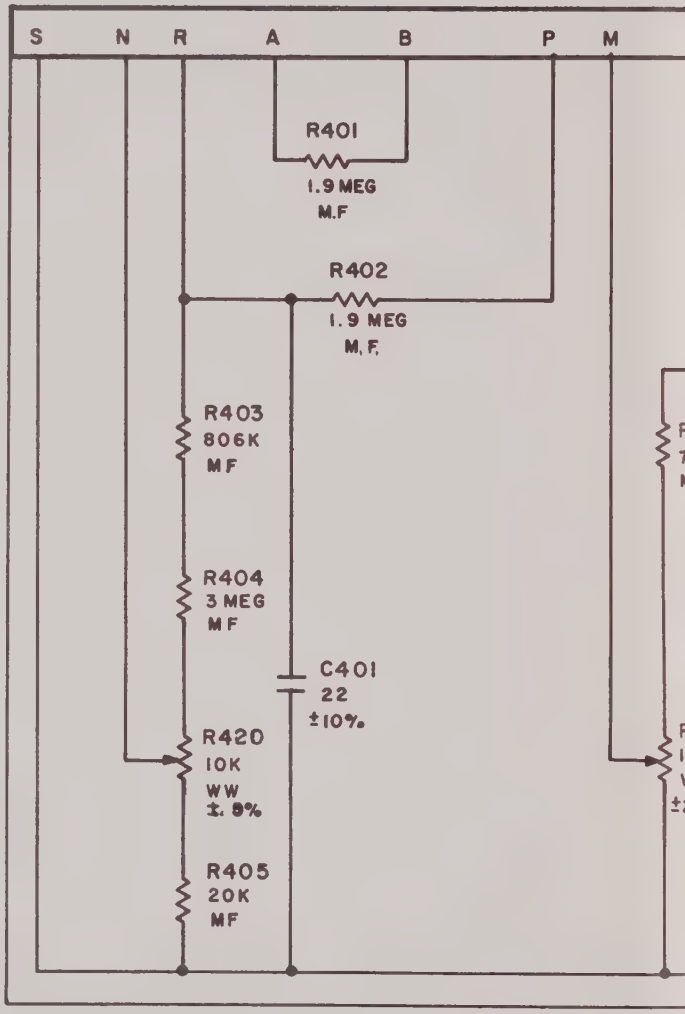


SCHEMATIC REF. DESIGNATION	LOWEST	HIGHEST
RESISTORS	R101	R150
CAPACITORS	C101	C110
DIODES	CR101	CR104
TRANSFORMER	T101	T101

THIS DRAWING IS SCHEMATICALLY EQUIVALENT TO VARIAN DRAWING E9717[illegible]

SCHEMATIC
F-[illegible]

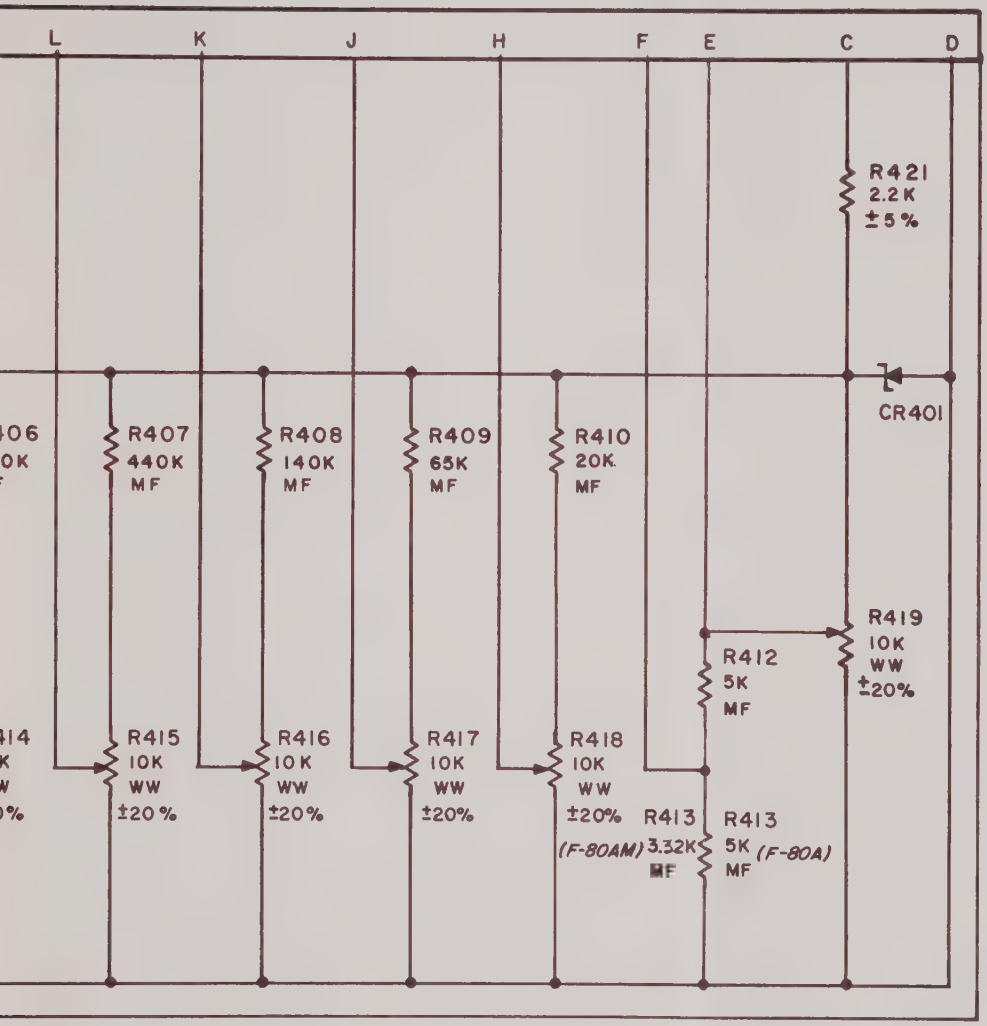
DASH NO.	TYPE OR MODEL	NEXT ASSEMBLY
	F-80A	C971753
	F-80AM	C971753



SCHEMATIC REF. DESIGNATION	LOWEST	HIGHEST
RESISTOR	R401	R421
CAPACITOR	C401	C401
DIODE	CR401	CR401

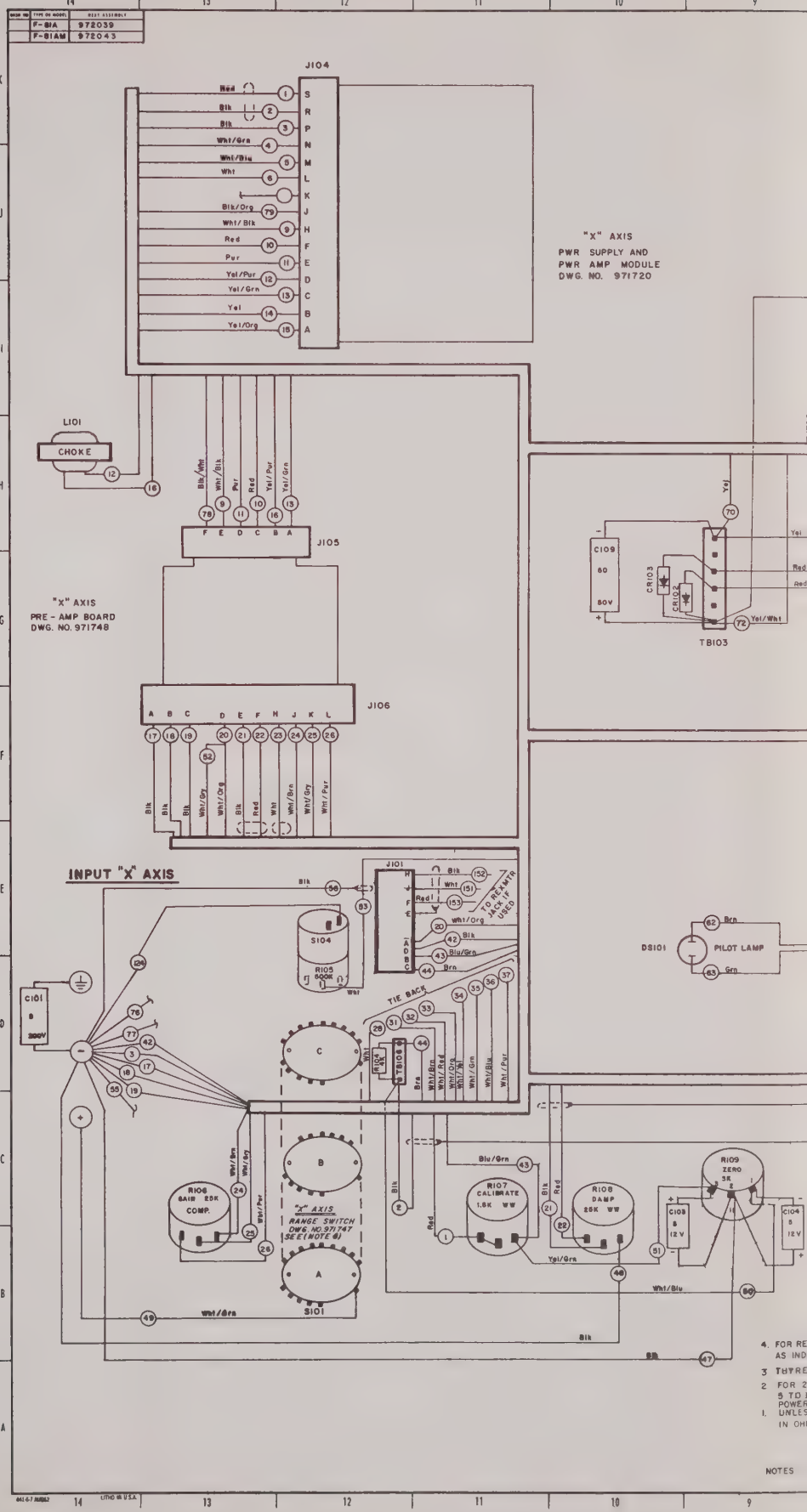
1. UNLESS OTHERWISE INDICATED:
   RESISTOR VALUES ARE IN OHMS, ±10%.
   CAPACITOR VALUES ARE IN MICROFARADS

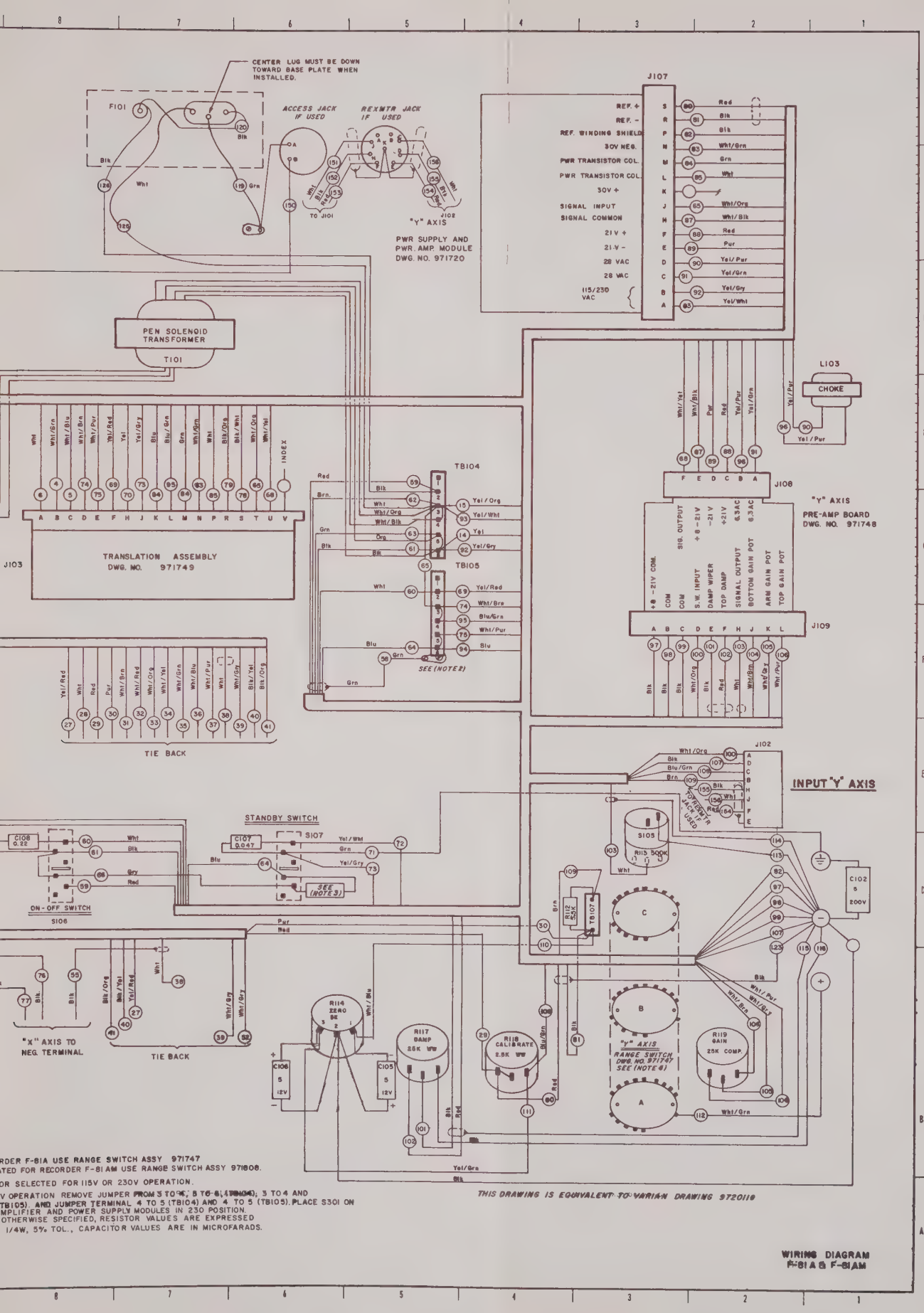
NOTES:



THIS DRAWING IS SCHEMATICALLY EQUIVALENT TO VARIAN DRAWING C972035D.

SCHEMATIC, TIME BASE

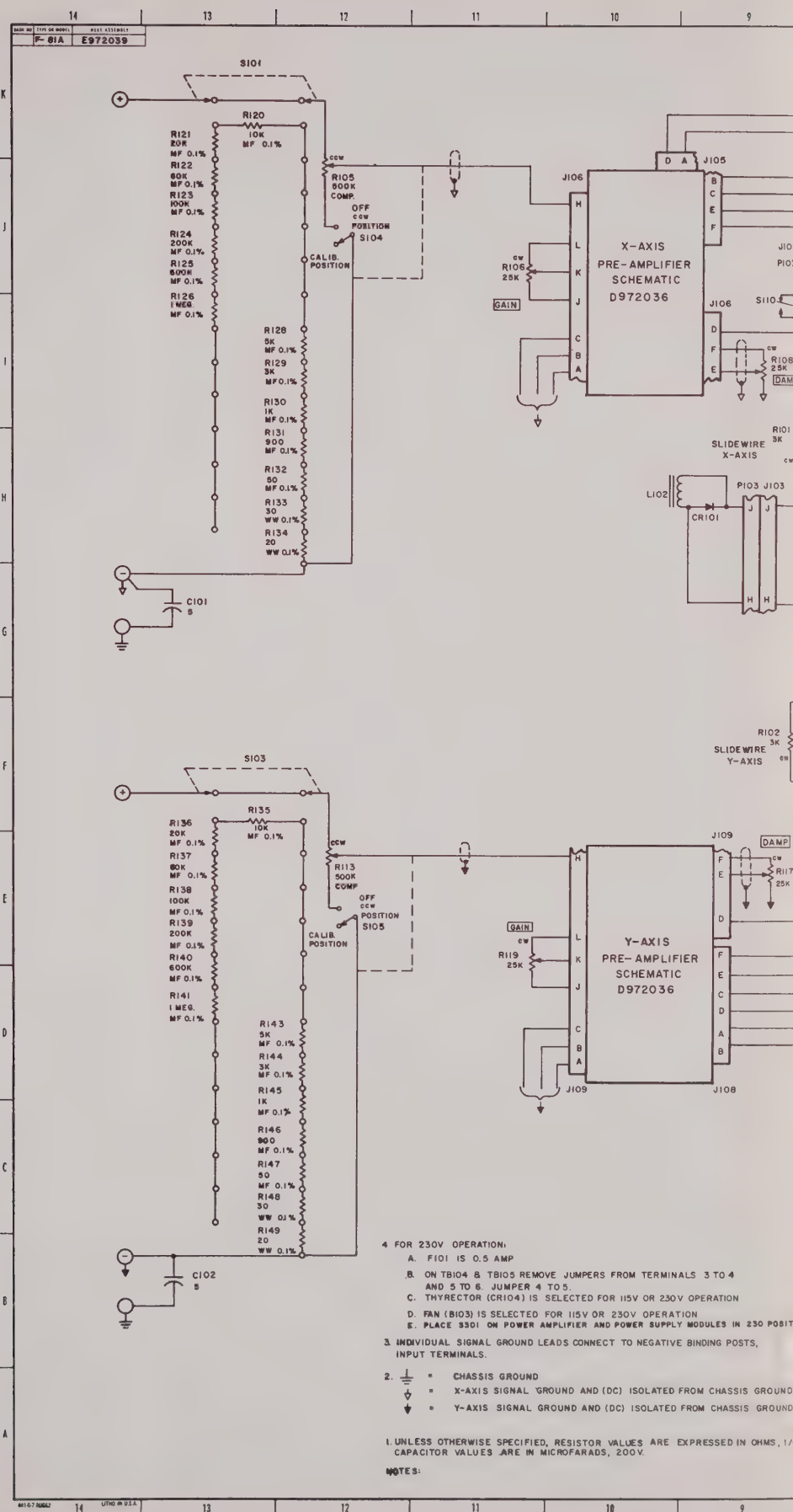

14 13 12 11 10 9
BASIC NO. | TYPE OR MODEL | TEST ASSEMBLY
F-81A | 972039
F-81AM | 972043
J104
Red 1
Blk 2
Blk 3
Wht/Grn 4
Wht/Blu 5
Wht 6
Blk/Org 7
Wht/Blk 8
Red 10
Pur 11
Yel/Pur 12
Yel/Grn 13
Yel 14
Yel/Org 15
S R P N M L K J H F E D C B A
"X" AXIS
PWR SUPPLY AND
PWR AMP MODULE
DWG. NO. 971720
L101
CHOKE
J105
F E D C B A
"X" AXIS
PRE - AMP BOARD
DWG. NO. 971748
J106
A B C D E F H J K L
TB103
C109
50
50V
CR103
CR102
INPUT "X" AXIS
J101
TO REAMTR JACK IF USED
S104
R105 500K
C101
200V
TIE BACK
R104 2K
TB104
C
B
A
S101
"X" AXIS
RANGE SWITCH
DWG. NO. 97747
SEE (NOTE 8)
R106 GAIN 25K COMP.
R107 CALIBRATE 1.6K WW
R108 DAMP 25K WW
R109 ZERO 5K WW
C103 8 12V
C104 8 12V
DS101
PILOT LAMP
Brn
Grn
Yel
Yel/Wht
Blu/Grn
Wht/Blu
Yel/Grn
Wht/Grn
Blk
Red
4. FOR RE
AS IND
3 THERE
2 FOR 2
5 TO
POWER
1. UNLES
IN OH
NOTES
14 13 12 11 10 9

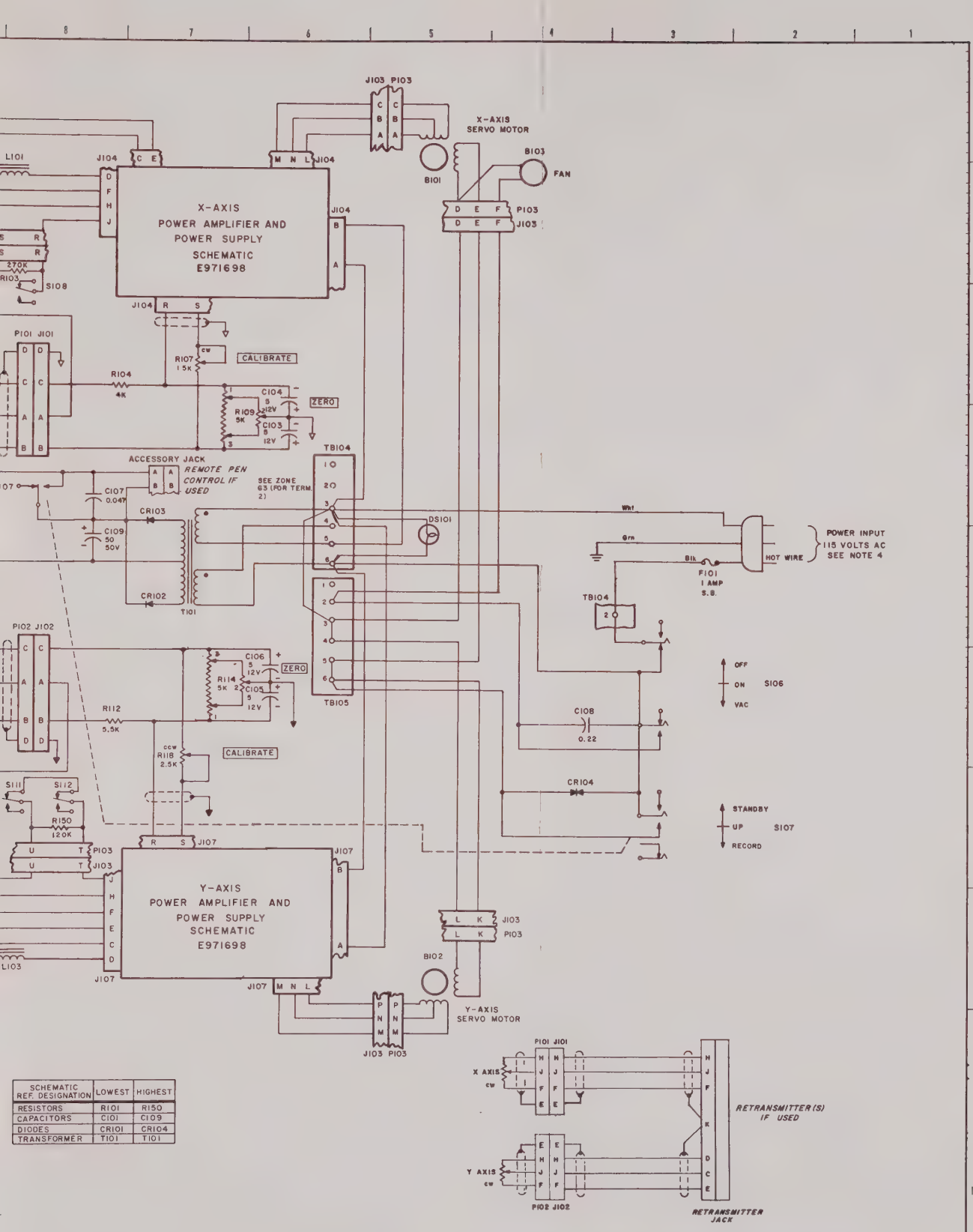


RDER F-81A USE RANGE SWITCH ASSY 971747
TED FOR RECORDER F-81AM USE RANGE SWITCH ASSY 971808.
OR SELECTED FOR 115V OR 230V OPERATION.
V OPERATION REMOVE JUMPER FROM 3 TO 4, 8 TO 6, 7 TO 8; 3 TO 4 AND
TB105). AND JUMPER TERMINAL 4 TO 5 (TB104) AND 4 TO 5 (TB105). PLACE S301 ON
MPLIFIER AND POWER SUPPLY MODULES IN 230 POSITION.
OTHERWISE SPECIFIED, RESISTOR VALUES ARE EXPRESSED
1/4W, 5% TOL., CAPACITOR VALUES ARE IN MICROFARADS.

THIS DRAWING IS EQUIVALENT TO VARIAN DRAWING 9720118

WIRING DIAGRAM
F-81A & F-81AM

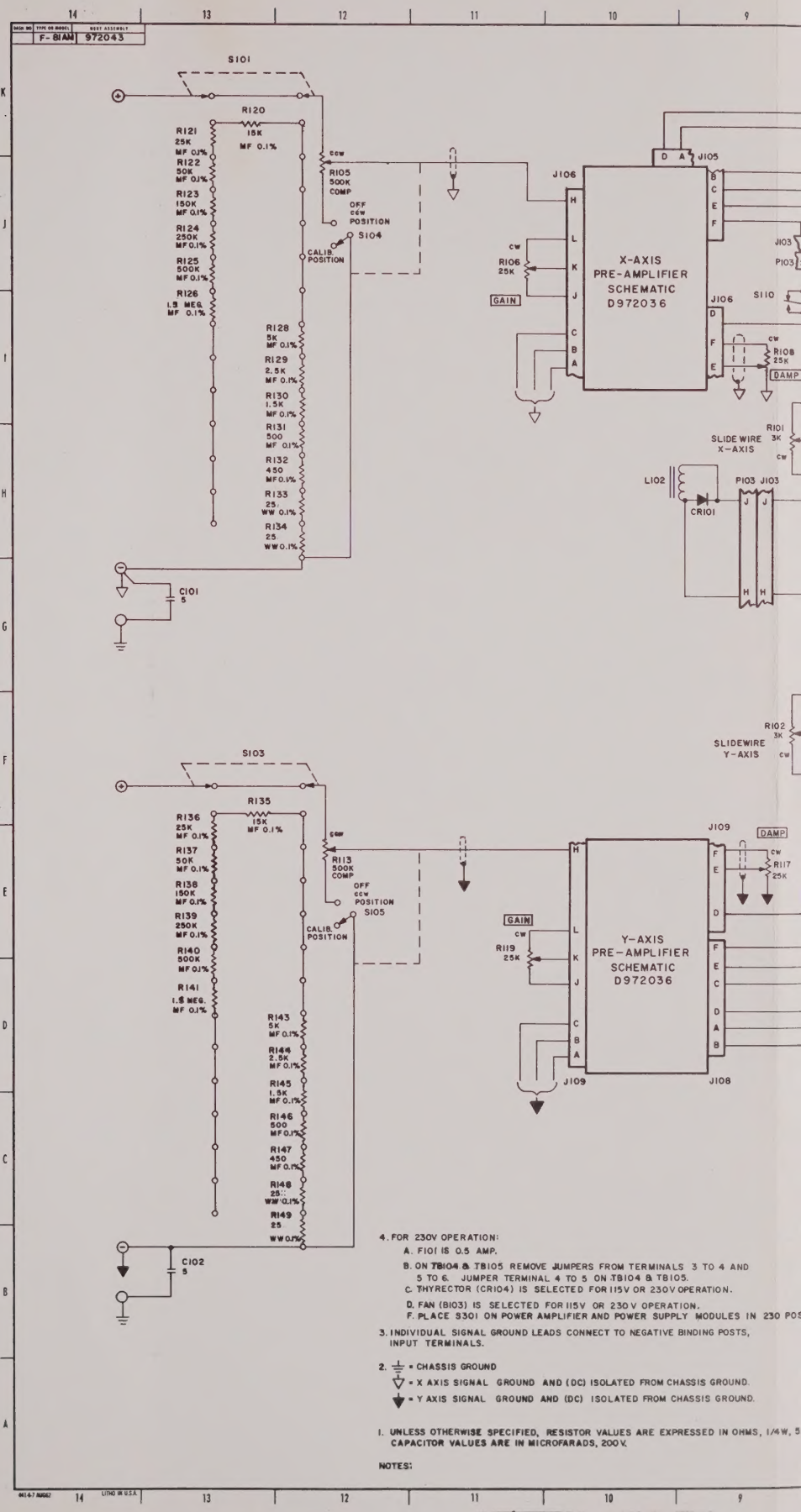

F-81A
E972039
S101
R120
10K
MF 0.1%
R121
20K
MF 0.1%
R122
60K
MF 0.1%
R123
100K
MF 0.1%
R124
200K
MF 0.1%
R125
600K
MF 0.1%
R126
1 MEG.
MF 0.1%
R105
500K
COMP.
CCW
OFF
CCW
POSITION
S104
CALIB.
POSITION
R128
5K
MF 0.1%
R129
3K
MF 0.1%
R130
1K
MF 0.1%
R131
900
MF 0.1%
R132
50
MF 0.1%
R133
30
WW 0.1%
R134
20
WW 0.1%
C101
5
J106
H
L
K
J
C
B
A
X-AXIS
PRE-AMPLIFIER
SCHEMATIC
D972036
D
A
J105
B
C
E
F
R106
25K
CW
GAIN
J106
D
F
E
R108
25K
CW
DAMP
SLIDEWIRE
X-AXIS
R101
3K
L102
CR101
P103 J103
J
J
H
H
S103
R135
10K
MF 0.1%
R136
20K
MF 0.1%
R137
60K
MF 0.1%
R138
100K
MF 0.1%
R139
200K
MF 0.1%
R140
600K
MF 0.1%
R141
1 MEG.
MF 0.1%
R113
500K
COMP.
CCW
OFF
CCW
POSITION
S105
CALIB.
POSITION
R143
5K
MF 0.1%
R144
3K
MF 0.1%
R145
1K
MF 0.1%
R146
900
MF 0.1%
R147
50
MF 0.1%
R148
30
WW 0.1%
R149
20
WW 0.1%
C102
5
R102
3K
SLIDEWIRE
Y-AXIS
J109
H
L
K
J
C
B
A
Y-AXIS
PRE-AMPLIFIER
SCHEMATIC
D972036
J109
J108
F
E
D
DAMP
CW
R117
25K
R119
25K
CW
GAIN
F
E
C
D
A
B
4 FOR 230V OPERATION:
A. F101 IS 0.5 AMP
B. ON TB104 & TB105 REMOVE JUMPERS FROM TERMINALS 3 TO 4 AND 5 TO 6. JUMPER 4 TO 5.
C. THYRECTOR (CR104) IS SELECTED FOR 115V OR 230V OPERATION
D. FAN (B103) IS SELECTED FOR 115V OR 230V OPERATION
E. PLACE 3301 ON POWER AMPLIFIER AND POWER SUPPLY MODULES IN 230 POSIT
3. INDIVIDUAL SIGNAL GROUND LEADS CONNECT TO NEGATIVE BINDING POSTS, INPUT TERMINALS.
2. = CHASSIS GROUND
= X-AXIS SIGNAL GROUND AND (DC) ISOLATED FROM CHASSIS GROUND
= Y-AXIS SIGNAL GROUND AND (DC) ISOLATED FROM CHASSIS GROUND
1. UNLESS OTHERWISE SPECIFIED, RESISTOR VALUES ARE EXPRESSED IN OHMS, 1/
CAPACITOR VALUES ARE IN MICROFARADS, 200V.
NOTES:



SCHEMATIC REF. DESIGNATION	LOWEST	HIGHEST
RESISTORS	R101	R150
CAPACITORS	C101	C109
DIODES	CR101	CR104
TRANSFORMER	T101	T101

5% TOL.

SCHEMATIC F-81A



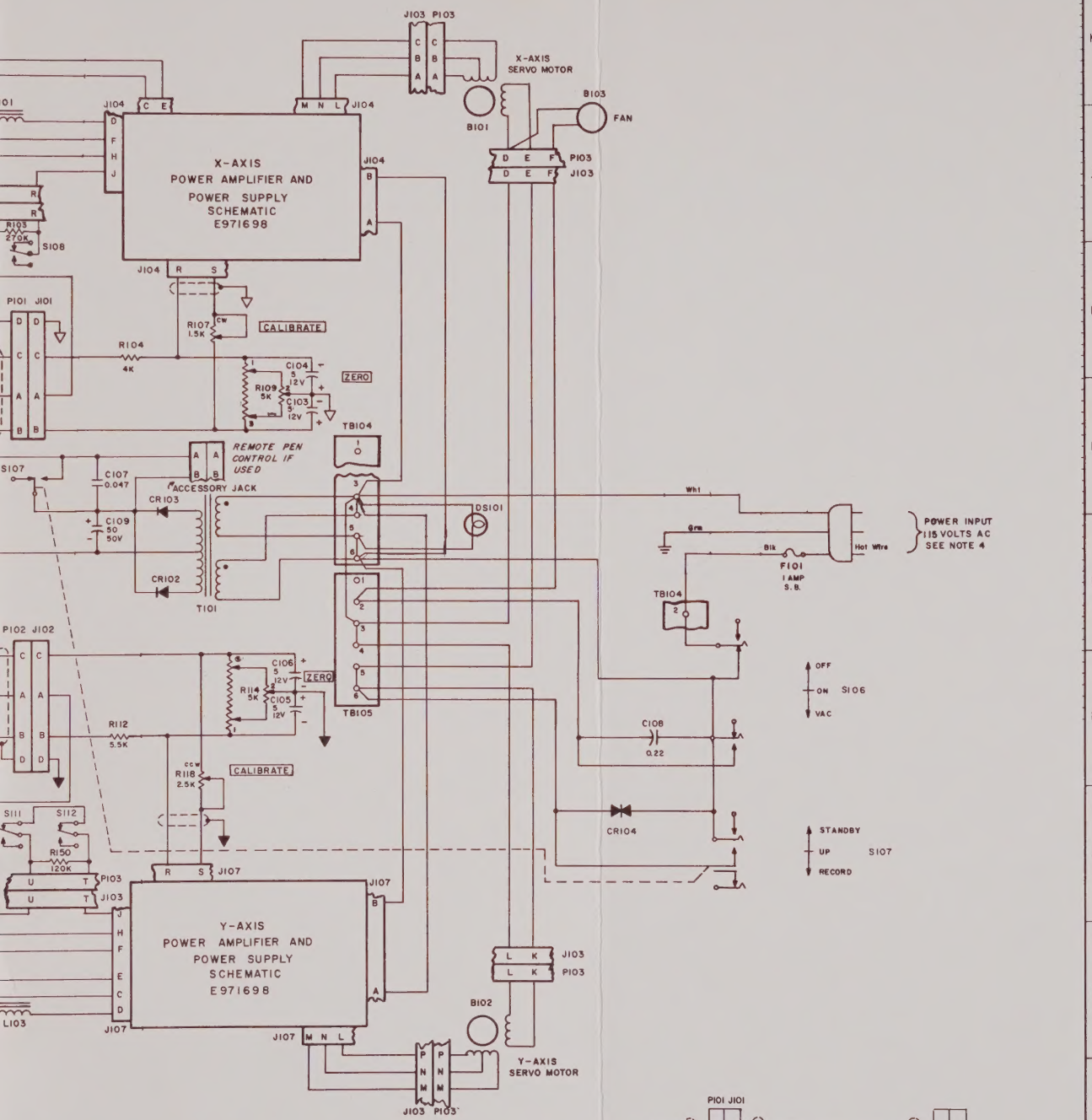
4. FOR 230V OPERATION:
   A. F101 IS 0.5 AMP.
   B. ON TB104 & TB105 REMOVE JUMPERS FROM TERMINALS 3 TO 4 AND 5 TO 6. JUMPER TERMINAL 4 TO 5 ON TB104 & TB105.
   C. THYRECTOR (CR104) IS SELECTED FOR 115V OR 230V OPERATION.
   D. FAN (B103) IS SELECTED FOR 115V OR 230V OPERATION.
   F. PLACE S301 ON POWER AMPLIFIER AND POWER SUPPLY MODULES IN 230 POS

3. INDIVIDUAL SIGNAL GROUND LEADS CONNECT TO NEGATIVE BINDING POSTS, INPUT TERMINALS.

2. ⏚ = CHASSIS GROUND
   ▽ = X AXIS SIGNAL GROUND AND (DC) ISOLATED FROM CHASSIS GROUND.
   ▼ = Y AXIS SIGNAL GROUND AND (DC) ISOLATED FROM CHASSIS GROUND.

1. UNLESS OTHERWISE SPECIFIED, RESISTOR VALUES ARE EXPRESSED IN OHMS, 1/4W, 5
   CAPACITOR VALUES ARE IN MICROFARADS, 200V.

NOTES:



SCHEMATIC REF. DESIGNATION	LOWEST	HIGHEST
RESISTORS	R101	R150
CAPACITORS	C101	C109
DIODES	CR101	CR104
TRANSFORMER	T101	T101

THIS DRAWING IS SCHEMATICALLY EQUIVALENT TO VARIAN DRAWING E972041G

SCHEMATIC
F-81AM

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